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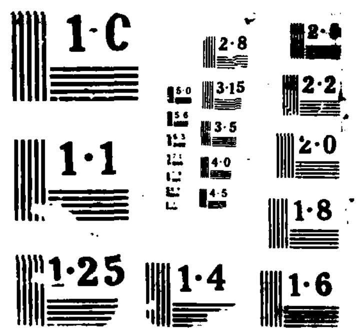
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TARGET DETECTION ROUTINE (TADER) USER'S GUIDE

SEPTEMBER 1987

PREPARED BY
FORCE SYSTEMS DIRECTORATE

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Documentation was prepared for the Target Detection Routine (TADER) developed at the US Army Concepts Analysis Agency. TADER was designed to compute the probability of operational target acquisition (POTA) of generic military units scanned by opposing sensor arrays over a fixed search period. Computed POTA vaues are input to a CAA nuclear fire planning model (NUFAM). TADER is a deterministic model which employs an input target lucrativeness threshold to filter out detections not suitable for targeting. The TADER User's Guide is structured to provide a user with sufficient information on model input/output and operation to effectively apply TADER. Additional information on TADER model logic may be found in the TADER Methodology Description (CAA-TP-87-9), published separately.

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TARGET DETECTION ROUTINE (TADER)

USER'S GUIDE

September 1987

Prepared by

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This User's Guide describes the use of the Target Detection Routine (TADER), developed during the Target Acquisition Study (TAS III), to compute values of probability of operational target acquisition (POTA) for input to a CAA nuclear fire planning model (NUFAM). Additional documentation on model methodology is in the separately published TADER Methodology Description (CAA-TP-87-9). The final study report on TAS III is separately published as CAA-SR-87-23.

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CHAPTER 1

GENERAL DESCRIPTION

1-1. PURPOSE OF THE USER'S GUIDE. The purpose of this user's guide is to provide users of version I of the Target Detection Routine (TADER I) sufficient information to use that model effectively. Throughout this document, TADER I shall also be denoted as TADER. TADER is a deterministic expected value computerized model which computes susceptibility to detection of generic military units which are scanned by opposing arrays of sensors of various types over a fixed scan period. The detection susceptibility of a unit is denoted as the probability of operational target acquisition (POTA) for that unit.

1-2. MODEL BACKGROUND. Prior to January 1976, the percent of knowledge (POK) estimates were used by the US Army Concepts Analysis Agency (CAA) as the basis for simulating target acquisition in Tactical Nuclear Force (TNF) studies. These values were determined subjectively, taking into consideration all known sources of target acquisition projected through the 1980 timeframe. Percent of knowledge is defined as the probability that a given unit type at a specified distance from the FEBA will be acquired by the opposing force. In May 1976, the Target Acquisition Study (TAS) was completed by CAA. This study developed the POTA concept as a replacement for the POK concept. The POTA methodology was updated and enhanced in the Target Acquisition Study II (TAS II) completed in August 1979. The results of TAS II were standard until the Target Acquisition Study III (TAS III) was undertaken in 1985 to update the results and methods of TAS II to reflect current requirements. In TAS III, the POTAs are produced with a new methodology, the Target Detection Routine (TADER), which was developed during the study. The TADER methodology is analytically described in a CAA technical paper (CAA-TP-87-9).

1-3. MODEL OVERVIEW

a. Purpose. The TADER model is used to determine the probability of detection of combat units of various types in specified distance intervals from the FLOT. The values developed are called 'POTA' (probability of operational target acquisition) or 'unit POTA' values. A POTA is the probability of detecting, recognizing and locating various types of potential targets at prescribed distances from the FLOT during a random but limited period of time in a day of intense combat.

b. Input Overview

(1) Sensors. The location of each sensor is specified and its coverage pattern is defined. For fixed radar/forward observer sensors and standoff SLARs, most sensor characteristics are input as a function of sensor zone. For these sensor types, a sensor zone is the region within the coverage pattern and between two specified distances from the sensor or sensor path. The entire range of coverage for this type sensor is

partitioned into sensor zones. For penetrating sensors, sensor characteristics are input as a function of target zone. Basic sensor capability input is in terms of inherent detection probability versus a single target element at specified distances from the sensor or by target zone, depending on the sensor type. The inherent detection probability is essentially that capability associated with ideal conditions. Degradation factors are then input to multiplicatively adjust inherent detection capability for various environmental conditions (e.g., smoke, bad weather) and target element activity (moving/static).

(2) Targets. Each target unit is composed of target elements (e.g., tanks). The number of elements of each type in the unit is specified by the user, usually in consideration of a generic TOE. In addition, each element type in each unit must be assigned a frequency of being in each of various activities, environments and personnel postures. Detection susceptibility can vary with the environment or activity of a target element. For example, a target moving in the open may be easier to detect than one which is static and partially concealed. Also, the frequency and rate of fire for artillery, rocket, or mortar shooters must be specified.

(3) Lucrativeness. The simplest and most basic criterion for detection of a unit is to treat the unit as detected if at least one target element in it is detected. However, such a criterion is often impractical because it can give excessive weight to small numbers of detections, with an associated risk of "passing," as a valid target, a detected unit too small to justify the resources required to destroy it. Therefore, the TADER POTA method allows the user to specify a threshold of detections which is used to "filter out" detections at subthreshold level. The term used for the filtered-out detections is 'nonlucrative' and is analogous to having insufficient evidence that a unit of a given type has been spotted, recognized and located at a given location. There are two types of lucrativeness thresholds, denoted by 'OR' and 'AND', that can be specified for each target element type. Detections are 'OR' lucrative if at least the 'OR' level is detected for at least one element type. Detections are 'AND' lucrative if at least the 'AND' level is detected for all applicable element types. A unit POTA is the probability of detections being lucrative under either the 'OR' or the 'AND' criteria.

c. Methodology. TADER treats probabilities of detection as statistically independent of each other. All processes and inputs are based on expected values over a fixed timeframe. Sensor coverage patterns are rigid in form, i.e., "cookie-cutter" type. Probability of sensor coverage in a target zone is based on a computerized graphic search determination of pattern and target overlaps. Once computed, probability of target coverage is combined with the degraded probability of detection given coverage. The model constructs unit detection probabilities over a partition of grid squares in each target zone in the following sequential manner:

(1) Operational detection probabilities are computed for a single sensor versus a single target element.

(2) The single-sensor/single-element operational detection probability is taken as the single event probability of a binomial distribution for the number of detections by the sensor scanning a specific target unit. The single sensor probability of lucrative detection is then computed, based on the specification "OR" and "AND" lucrativeness thresholds.

(3) The single sensor probabilities of lucrative detection for each grid square in the target zone are combined into an overall (all systems) probability of lucrative detection of a unit in the grid square.

TADER computes the overall unit detection probability at many grid squares (approximating point locations) within a target zone and averages the values to determine a POTA for the zone.

1-4. PROJECT REFERENCES

a. Target Acquisition Study (TAS), CAA-TP-76-2, US Army Concepts Analysis, May 1976 (SECRET-NOFORN)

b. Target Acquisition Study II (TAS II), CAA-TP-79-4, US Army Concepts Analysis Agency, Aug 1979 (SECRET-NOFORN)

c. Target Acquisition Study III (TAS III), CAA-SR-87-23, US Army Concepts Analysis Agency, Sep 1987 (SECRET-NOFORN)

d. Target Detection Routine (TADER) Model Description, CAA-TP-86-4, US Army Concepts Analysis Agency, March 1986 (UNCLASSIFIED)

1-5. ASSUMED BACKGROUND OR READER. The reader should be familiar with the conceptual framework of the TADER model described in the TADER Methodology Description (CAA-TP-87-9). A basic familiarity with the defining parameters of target acquisition system types (e.g., radars, reconnaissance aircraft) is also required.

1-6. SECURITY AND PRIVACY. All program code and listings are UNCLASSIFIED and require no special security considerations.

a. The classification of output reports depends on the specific data base used and the type and labeling of generated output. All example output in this report is UNCLASSIFIED.

b. The classification of input files is also a function of the data base used and the user's use of labeling. All example input in this report is UNCLASSIFIED.

CHAPTER 2

MODEL SUMMARY

2-1. MODEL OPERATION

a. TADER is designed to operate entirely from card image input constructed by the user.

b. TADER output, described in Chapter 3, consists of a printed file and two disc files which can serve as input to two postprocessors, the sort/count postprocessor and the dominant system postprocessor. The disc file output is on logical units 12 and 14. The type and quantity of print output can be controlled by user-input print option flags.

c. Runstream Operating Instructions. Figure 2-1 shows an operational runstream for executing the TADER program and all of its processors on the UNISYS 1100/82 computer. The line numbers on the left of the figures are not part of the runstream. Elaborating remarks, keyed to line number include:

(1) Line 1 is the run identification/account card. It shows account information for run A1M2 and specifies a maximum of 20 minutes for run time and 450 pages for output.

(2) Line 2 prints an "unclassified" heading on each output page. (The user must determine output classification).

(3) Line 3 assigns the file M2FILE which contains the program and data elements of TADER and its processors.

(4) Line 4 equates the name G to the filename M2FILE (for ease of reference).

(5) Line 5 executes the absolute element G.PREP for the data display processor (explained in paragraph 2-7). Source code for this processor is in Appendix B.

(6) Line 6 adds as input to the data display processor the element G.PREPDATA containing supplemental input to that processor. Format and structure of this data base are explained in paragraph 2-7.

(7) Line 7 adds as input to the data display processor the element G.TADERDATA containing the TADER input data base. This data base, defining sensor and target unit parameters, is explained in paragraph 2-5.

(8) Line 8 assigns a temporary file 12 on logical unit 12. TADER writes selected output on this unit for use as input to the Dominant System Processor Format and structure of this file are explained in paragraph 3-5.

(9) Line 9 assigns a temporary file 14 on logical unit 14. TADER writes selected output on this unit for input to the Sort/Count Processor. Format and structure of this file are explained in paragraph 3-5.

(10) Line 10 executes the absolute element G.TADEREX for TADER. Source code for TADER is in Appendix A.

(11) Line 11 adds as input to TADER the element G.TADERDATA containing the TADER input data base. This data base is described in paragraph 2-5.

(12) Line 12 executes the absolute element G.DOMEX for the Dominant System Processor. Source code for the Dominant System Processor is in Appendix C.

(13) Line 13 adds as user input to the Dominant System Processor the element G.DOMDATA. The structure and format of this input are described in paragraph 3-6.

(14) Line 14 executes the absolute element G.SORTEX for the Sort/Count processor. Source code for the Sort/Count Processor is in Appendix D.

(15) Line 15 adds as user input to the Sort/Count Processor the element G.SORTDATA. The structure and format of this input are described in paragraph 3-7.

(16) Line 16 terminates the runstream.

```
1  @RUN/TP  A1M2A,F2222T22222 UNCLASSIFIED,20,450
2  @HDG            *****  UNCLASSIFIED  *****
3  @ASG,A   M2FILE
4  @USE     G.M2FILE
5  @XQT     G.PREP
6  @ADD     G.PREPDATA
7  @ADD     G.TADERDATA
8  @ASG,T   12.,///150
9  @ASG,T   14.,///400
10 @XQT     G.TADEREX
11 @ADD     G.TADERDATA
12 @XQT     G.DOMEX
13 @ADD     G.DOMDATA
14 @XQT     G.SORTEX
15 @ADD     G.SORTDATA
16 @FIN
```

Figure 2-1. Operational Runstream for TADER

2-2. MODEL CONFIGURATION. The current TADER, its preprocessors, and its postprocessors, were developed primarily for the UNISYS 1100/82 Multi-Processing System at CAA. They are coded in FORTRAN.

2-3. MODEL ORGANIZATION. TADER can be implemented as a single processor which reads scenario, sensor and target characteristics from a card image data base and generates average probabilities of operational detection for the scenario sensor systems scanning each specified target unit type randomly located in each target zone. While TADER can be operated as a standalone model, the following processors have been constructed to facilitate analysis:

a. A Data Base Display Processor produces a readable display of a TADER input data base. This processor is described in paragraph 2-7 and Appendix B.

b. The Dominant System Postprocessor accepts as input the logical unit 12 file output from a TADER run and lists, for every unit processed, the most dominant (largest) single-system POTAs contributing to form the unit POTA, along with the "single-system POTA vs element type" components of the listed single-system POTAs. This processor is described in Chapter 3 and Appendix C.

c. The Sort/Count Postprocessor is described in Chapter 3 and Appendix D and accepts as input the logical unit 14 file output from a TADER run. It generates:

(1) Matrices showing the number of target units with single-system POTAs between specified bounds (by element type in each target zone).

(2) Matrices for each target zone and element type showing which system/unit combination have single-system POTA values within specified bounds.

2-4. OVERVIEW OF OPERATIONAL FEATURES

a. Input. The order and structure of a TADER input data base are summarized in Table 2-1. The size of the data base depends on the number and types of sensor systems, the number of target units, the number of target element types, the number of target zones and the number of sensor zones. In a (typical) scenario employing 20 sensor systems, 5 element types, 30 unit types, 5 target zones, and 5 sensor zones, the scenario definition data set has 7 records, the system data set may have 600 records and the unit data set has 900 records, for a total data base of 1,507 records. Preparation and interpretation of such a large volume of data is complex, even with computer assisted preprocessing.

b. Output. The outputs of TADER are described in detail in Chapter 3. The amount of print output is variable, depending on user options. The minimum is a single table of overall POTAs showing the combined effect of all sensor systems against each target unit type in each target zone. In this case a single line of output results is printed for each target unit considered. The print flag options can expand the print output to unwieldy proportions since they generate individual results for many combinations of units, element types, sensor systems, target zones and sensor zones and so should be used with caution.

Table 2-1. TADER Input Data Base

Scenario Definition Data Set (7 records)
- Run ID data
- Unit/system parameters
- Sensor scale factors
- Target zones
- Row sampling parameters
- Grid square dimensions
- Sensor zones

System Data Set (one set per system, each with up to 11 data subsets)
- System degradation subset (one record)
- System visibility subset (one record)
- System employment subset (one record)
- Coverage subset for STANO radars and penetrating sensors (one record for each STANO radar, if applicable, or one record for each coverage rectangle of each penetrating sensor mission)
- System availability subset (one record)
- System range capability subset (one record - omitted for standoff SLAR and penetrating system)
- System inherent detection probability subset (IELT records, i.e., one per element type)
- System capability modifier subset/A=1, E=1 (IELT records)
- System capability modifier subset/A=1, E=2 (IELT records)
- System capability modifier subset/A=2, E=1 (IELT records)
- System capability modifier subset/A=2, E=2 (IELT records)

Unit Data Set (one set per target unit, each with two data subsets)
- Troop posture subset (NZONE records, i.e., one per target zone)
- Target element descriptor subset (5 x IELT records) which consists of IELT record sets. Each set, for an element type J, consists of:
  - Target element quantity record
  - Target element activity/environment record/A=1, E=1
  - Target element activity/environment record/A=1, E=2
  - Target element activity/environment record/A=2, E=1
  - Target element activity/environment record/A=2, E=2

c. Limitations. The range of values for TADER inputs is restricted by the DIMENSION statements in the program code. The restrictions in the current version of TADER are summarized in Table 2-2. It is usually an easy matter to relax a restriction by altering the program source code; however, additional computer memory will then be required for a model execution. In the current configuration, TADER requires 130,000 words of memory on the UNISYS 1100/82 computer. In addition, TADER has the following restrictions on its application:

(1) Signal intelligence (SIGINT) emitters are not treated, except as nonemitting target elements (e.g., trucks) which contain or carry them.

(2) Separate target element detections are treated as statistically independent of each other.

(3) Final POTA results are not relative to a target unit at a fixed location, but to a target unit randomly located within a specified target zone.

(4) POTAs are not expressed or determined as a function of elapsed time but are expected values over a fixed time interval of operation (normally two hours).

Table 2-2. Restrictions on TADER Input Values

TADER Name	Description	Maximum value
NUMU	Number of target unit types	50
IELT	Number of target element types	5
NSEN	Number of systems gamed	30
NZONE	Number of target zones	10
NSZONE	Number of sensor zones	10
NSYS(N)	Number of sensors (missions) in system *N*	*110*
NPIECE(N)	Number of coverage rectangles used to define coverage of a penetrating system N	110

d. Processing Time. The central processing time required for a single TADER execution depends on the number of sensor systems, target units, element types, target zones, and sensor zones as well as the resolution of the coverage grid. A case with 23 systems against 37 unit types, using five element types, five target zones, and five sensor zones, and a 1.00 km coverage grid resolution in a 70km by 300km battlefield sector has typically required 6-15 central processing minutes on the UNISYS 1100/82 computer at CAA. Processing time is very sensitive to coverage grid resolution.

2-5. INPUT DATA BASE. The entire TADER data base (Table 2-1) is read from logical unit 5. The number of records in a data set is variable, being a function of the number of systems and target units played. The items of the component data sets are described below in terms of their internal names in TADER, input formats, and definitions.

a. Scenario Definition Data Set. Table 2-3 describes this set. This set is fixed at seven cards and defines the run identifier, the lucrativeness fraction used in the run, the number of target unit types, the number of target element types, the number of sensor systems, print flags for output, the number and structure of target zones, the number of rows of grid squares to be processed in each target zone, the size of a grid square in each target zone, the number and structure of sensor zones, and the size of the battlefield sector available for scanning. In addition, one card contains scale factors used to multiplicatively adjust inherent sensor detection capability. The following elaborating remarks apply:

(1) The setting of IU1 on the run ID card enables quicker calculation of binomial probabilities through an approximation by the normal probability distribution. The binomial distribution with parameters N (number of events) and p (event probability) is approximated by a normal distribution with mean Np and variance np(1-p) if N exceeds IU1. In TADER, N is equated to the number of elements of a specific type in a target unit. The approximation is best for large values of IU1.

(2) In order to operate TADER with unadjusted inherent detection probability input, the scale factor for each system should be set equal to 1.00. To run a night scenario, the effects of day-restricted sensor systems could be zeroed out by setting the sensor scale factor to zero for those systems.

Table 2-3. Scenario Definition Data Set Format
(page 1 of 5 pages)

TADER name	Column	Entry	Format
		Run ID data	
TD1	1-2	Alphanumeric portion of run ID	A2
.ID1	3-5	Integer portion of run ID	I3
TADD	6-10	Incremental offset which is added to the input "OR" lucrativeness value to yield the lucrativeness value used in this run. The input value of TADD is added to all "OR" lucrativeness input fractions input on the target element quantity card of the unit data set. TADD, when nonzero, can be used in constructing lucrativeness sensitivity tests.	F5.2
IU1	11-15	The number of target elements above which a normal approximation of the binomial is used instead of the binomial. The approximation is best for large values of IU1. It is recommended that IU1 be set to a value of at least 40. The approximation is poor for small values. For efficient operation, IU1 should also be less than 1,500.	I5
NOWRIT	16-20	If NOWRIT is greater than zero, TADER results are written onto logical units 12 and 14 for use by the Sort/Count Postprocessor and the Dominant System Postprocessor. If NOWRIT is zero or less, this output is not produced.	I5
		Unit/system parameters	
NUMU	1-3	Number of unit types to be considered by the routine (not to exceed 50).	I3
IELT	4-6	Number of target element types (e.g., tracked vehicles) to be considered by the routine (not to exceed five). Without program modification, the current configuration requires the user to enter IELT=5 for the five "hard coded" target element types represented in TADER. In order, these are: personnel, wheeled vehicles, tracked vehicles, artillery/rockets, and mortars.	I3

Table 2-3. Scenario Definition Data Set Format
(page 2 of 5 pages)

TADER name	Column	Entry	Format
NSEN	7-9	Number of sensor systems to be considered by the routine (not to exceed 30).	I3
NZONE	10-12	Number of target zones to be considered by the routine (not to exceed 10). Target zones are based on distance from the FLOT.	I3
LUNIT	13-15	Print control flag. 1. If LUNIT is greater than zero, the two (ordered and not ordered) single-system POTA tables are printed for each unit. 2. If LUNIT is zero or less, the above tables are not printed.	I3
LTHR	16-18	Print control flag. 1. If LTHR is greater than zero, TOE and lucrativeness threshold input for each unit are printed. 2. If LTHR is zero or less, the above are not printed.	I3
NSZONE	19-21	Number of sensor surveillance zones to be considered by the routine (not to exceed 10). Sensor zones are based on distance from an emplaced sensor.	I3
NZFLAG	25-27	Input flag controlling the processing of inherent sensor detection data. If NZFLAG is zero or negative, then the inherent sensor detection input data and system capability modifier input data for a target element type are based on the sensor zone containing the target. (These are in the System Data Set.) If NZFLAG is greater than zero, then detection data and system capability modifier data for a target element type are based on the target zone containing the target.	I3

Table 2-3. Scenario Definition Data Set Format
(page 3 of 5 pages)

TADER name	Column	Entry	Format
		Sensor scale factors	
PCD(N)	1-80	The scale factors applied to the input inherent detection probabilities (PDET(J,L,N)) of detection for system N, N = 1, ... NSEN. The sensor scale factors enable the user to run a parametic variation of a base data set by defining scale factors which multiplicatively adjust each input inherent detection probability entered on the system inherent detection probability subset for each system N. One scale factor is input for each system. The input scale factor for a system applies to all element types J and all sensor zones L. Each sensor scale factor record can input up to 20 scale factors. If there are more than 20 systems, i.e., if NSEN exceeds 20, an additional record must be input.	20F4.2
		Target zones	
		(A target zone n consists of the sector area betweem ZD(n-1) km from the FLOT and ZD(n) km from the FLOT).	
ISWD	2-4	Length (km) of the FLOT for the particular sector under consideration. The value of ISWD defines the width of the battlefield sector available for scanning. The distance from the FLOT to the rear boundary of the last target zone (=ZD(NZONE) defines the depth of the battlefield sector. All distances are in kilometers.	I3
ZD(1)	9-12	Distance (km) from the FLOT to the rear boundary of target zone 1.	F4.0
ZD(2)	15-18	Distance (km) from the FLOT to the rear boundary of target zone 2.	F4.0
ZD(3)	21-24	Distance (km) from the FLOT to the rear boundary of target zone 3.	F4.0

Table 2-3. Scenario Definition Data Set Format
(page 4 of 5 pages)

TADER name	Column	Entry	Format
ZD(4)	27-30	Distance (km) from the FLOT to the rear boundary of target zone 4.	F4.0
ZD(5)	33-36	Distance (km) from the FLOT to the rear boundary of target zone 5.	F4.0
ZD(6)	39-42	Distance (km) from the FLOT to the rear boundary of target zone 6.	F4.0
ZD(7)	45-48	Distance (km) from the FLOT to the rear boundary of target zone 7.	F4.0
ZD(8)	51-54	Distance (km) from the FLOT to the rear boundary of target zone 8.	F4.0
ZD(9)	57-60	Distance (km) from the FLOT to the rear boundary of target zone 9.	F4.0
ZD(10)	63-66	Distance (km) from the FLOT to the rear boundary of target zone 10.	F4.0
		Row sampling parameters	
IAVG(K), K=1, 10	1-50	During processing of target zone K, only every nth row of grid squares is processed, where n = IAVG(I)	10I5
		Grid square dimensions	
XAVG(K), K=1, 10	1-50	Length of side of each grid square processed in target zone K. A target zone, K, is partitioned into uniform grid squares, each with side XAVG(K) as specified on the grid square card. These grid squares are processed by row (a row is parallel to the FLOT). In order to save time, at the risk of a less precise result, it is possible to specify processing of only every nth row in the zone by specifying n = IAVG(K) of the row sampling card. The value of XAVG(K), must be at least 1.0. If XAVG(K) does not evenly divide into a zone dimension (ISWD or (ZD(K)-ZD(K-1)) then the largest portion fitting within the zone is used.	10F5.1

Table 2-3. Scenario Definition Data Set Format
(page 5 of 5 pages)

TADER name	Column	Entry	Format
		Sensor zones	
ZDS(1)	1-6	Distance (km) from the sensor to the far boundary of sensor zone 1. (For a specified sensor, sensor zone n consists of the region between ZDS(n-1) km from the emplaced sensor and ZDS(n) km from the sensor).	F6.0
ZDS(2)	7-12	Distance (km) from the sensor to the far boundary of sensor zone 2.	F6.0
ZDS(3)	13-18	Distance (km) from the sensor to the far boundary of sensor zone 3.	F6.0
ZDS(4)	19-24	Distance (km) from the sensor to the far boundary of sensor zone 4.	F6.0
ZDS(5)	25-30	Distance (km) from the sensor to the far boundary of sensor zone 5.	F6.0
ZDS(6)	31-36	Distance (km) from the sensor to the far boundary of sensor zone 6.	F6.0
ZDS(7)	37-42	Distance (km) from the sensor to the far boundary of sensor zone 7.	F6.0
ZDS(8)	43-48	Distance (km) from the sensor to the far boundary of sensor zone 8.	F6.0
ZDS(9)	49-54	Distance (km) from the sensor to the far boundary of sensor zone 9.	F6.0
ZDS(10)	55-60	Distance (km) from the sensor to the far boundary of sensor zone 10.	F6.0

b. System Data Set. Table 2-4 describes this set. The set consists of up to 11 data subsets (one subset is included only for penetrating sensor system types). The system data set specifies the performance and degradation factors for each system (suite of sensors of one type) of the NSEN systems specified in the scenario definition data set. Each system data set should be input in an identifiable logical sequence to the user, i.e., system N is associated with the N-th system data set entered. Exactly NSEN system data sets must be entered. The following elaborating remarks apply:

(1) The inherent detection probability of a system is the single-sensor/single-element detection capability under ideal conditions. Increasing sensor zone index corresponds to increasing distance from a sensor. For a system, the inherent probability subset shows the base (ideal) single-sensor detection capability of a single sensor of that system against a single element in various range bands.

(2) In all the system capability modifier subsets, the values entered are factors which, when multiplied by the corresponding values of inherent detection probability, will adjust those values for various combinations of target element activity/environment conditions. TADER processes exactly two element activity states, moving (A=1) and stationary (A=2), in combination with two element environments "in the open" (E=1) and "in woods or towns" (E=2). These four combined states are assumed exhaustive and independent. The system capability modifier subsets implicitly define detection distributions for all activity/environment states an element can be in.

Table 2-4. System Data Set (System N)
(page 1 of 9 pages)

TADER name	Column	Entry	Format[1]
		System degradation subset	
PWEA(N)	4-7	Relative effectiveness of a sensor of system N due to weather degradation during the period under consideration (expressed as a decimal value). This is a multiplicative factor of inherent detection probability.	F4.0
PSMO(N)	9-12	Relative effectiveness of a sensor of system N due to smoke degradation during the period under consideration (expressed as a decimal value). This is a multiplicative factor of inherent detection probability.	F4.0
PCPF(N)	14-17	Relative effectiveness of a sensor of system N due to crew performance problems during the period under consideration (expressed as a decimal value). This is a multiplicative factor of inherent detection probability.	F4.0
ICMB(N)	19-20	Sensor type identifier applicable to all sensors of system N. Enter "0" for ground surveillance radar or forward observers. Enter "1" for countermortar/counterbattery type radar. Enter "2" for counterbattery penetrating system. Enter "3" for SLAR reconnaissance systems which operate parallel to the FLOT (standoff air SLAR sensors). Enter "4" for reconnaissance systems which penetrate the FLOT (penetrating sensors).	I2
SID(N)	21-23	Input alphabetic label for sensor system N.	A3
PWIND(N)	25-28	Relative effectiveness of a sensor of system N due to wind conditions during the period under consideration. This is a multiplicative factor of inherent detection probability.	F4.2
		Sensor visibility subset	
PVIS(1,N)	1-4	Probability that a target element in sensor zone 1 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(2,N)	6-9	Probability that a target element in sensor zone 2 would have a clear line of sight to a sensor of system N.	F4.0

(1)The format F4.0 is used to read input fractions because a decimal in a field overrides the decimal placement implied in an input format statement. The user must enter the decimal point for some input entries read under a F4.0 format.

Table 2-4. System Data Set (System N)
(page 2 of 9 pages)

TADER name	Column	Entry	Format(1)
PVIS(3,N)	11-14	Probability that a target element in sensor zone 3 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(4,N)	16-19	Probability that a target element in sensor zone 4 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(5,N)	21-24	Probability that a target element in sensor zone 5 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(6,N)	26-29	Probability that a target element in sensor zone 6 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(7,N)	31-34	Probability that a target element in sensor zone 7 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(8,N)	36-39	Probability that a target element in sensor zone 8 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(9,N)	41-44	Probability that a target element in sensor zone 9 would have a clear line of sight to a sensor of system N.	F4.0
PVIS(10,N)	46-49	Probability that a target element in sensor zone 10 would have a clear line of sight to a sensor of system N.	F4.0
		Sensor employment subset	
NSYS(N)	2-4	The number of sensors employed in system N. For standoff SLAR systems, this is the number of missions. All sensors (or missions) of system N have identical characteristics (defined below). This entry is ignored when ICMB(N) = 2 or 4 (penetrating systems).	I3
STB(N)	5-10	Used only when ICMB(N) = 3 (standoff SLAR) or when ICMB(N) = 0 or 1 (STANO, counterbattery radars, observers). - When ICMB(N) = 3, this is the standoff (km) of the SLAR path relative to the FLOT. The SLAR path is assumed parallel to the FLOT and with length equal to sector width. All missions of a SLAR system have the same SLAR path. - When ICMB(N) = 0 or 1 and STB(N) is less than 1,000, then this is the standoff of all sensors of system N under the assumption that they are uniformly emplaced on	F6.0

Table 2-4. System Data Set (System N)
(page 3 of 9 pages)

TADER name	Column	Entry	Format(1)
		Sensor employment subset	
		a line parallel to the FLOT. TADER then internally generates the sensor locations. If ICMB(N) = 0 or 1 and STB(N) is at least 1,000, then STB(N) is a flag indicating that the locations of the sensors are to be read from user input (on the coverage subset for STANO radars and penetrating sensors).	
THEA(N)	11-16	Sensor scan angle characterizing each sensor of system N when ICMB(N) = 0 or 1. When ICMB(N) = 2, 3 or 4, this entry is ignored. The value of THEA(N) is entered in radians.	F6.0
NPIECE(N)	23-28	For ICMB(N) = 4 (penetrating sensor system) or for ICMB(N)=2 (counterbattery penetrator) this is the number of coverage rectangles in all the missions of sensor system N. The coverage patterns over all missions (or sensors) of the system must be described as a single set of NPIECE rectangles, each with sides parallel to those of the (rectangular) battlefield sector. These rectangles can overlap. The value of NPIECE(N) should not exceed 110. This entry is ignored when ICMB(N) is not equal to 2 or 4.	I6
SRANGE	29-34	If ICMB(N)=3 standoff SLAR this is the maximum range(km) of the sensor. Else it is ignored.	F6.2
		Coverage subset for STANO radars, counterbattery penetrators, and penetrating sensors (one record for each of NPIECE coverage rectangles if ICMB(N)=4 or if ICMB(N)=2 or one record for each of NSYS(N) emplaced sensors of system N if STB(N) exceeds 1000 when ICMB(N)=0,1; Else omitted).	
RT(I,N)	1-10	Used only when ICMB(N) = 0, 1, 2, or 4. For ICMB = 0 or 1, this is the horizontal (x-) coordinate of the Ith emplaced sensor of system N. For ICMB(N) = 2 or 4, this is the horizontal (x-) coordinate of the left edge of the Ith coverage rectangle for missions of system N. (Coordinates are in km relative to origin at lower left corner of battlefield sector. Horizontal is defined as parallel to the FLOT.)	F10.4
VPEN(I,N)	11-20	Used only when ICMB = 0, 1, 2, or 4. For ICMB(N) = 0 or 1, this is the vertical (y-) ordinate of the Ith emplaced sensor of system N. For ICMB(N) = 2 or 4, this is the vertical (y-) ordinate of the bottom of the Ith coverage rectangle for missions of system N.	F10.4

Table 2-4. System Data Set (System N)
(page 4 of 9 pages)

TADER name	Column	Entry	Format
HPEN(I,N)	21-30	Used only when ICMB(N) = 2 or 4. This is the horizontal (parallel to FLOT) dimension (km) of the Ith coverage rectangle for missions of system N.	F10.4
UPEN(I,N)	31-40	Used only when ICMB(N) = 2 or 4. This is the vertical (perpendicular to FLOT) dimension (km) of the Ith coverage rectangle for missions of system N.	F10.4
		System availability subset	
FA(N)	2-5	System availability factor, expressed as the percent of time a sensor of system N is expected to be available during the period under consideration.	F4.0
FS(N)	8-11	System availability factor, expressed as the percent of time a sensor of system N is expected to survive during the period under consideration.	F4.0
		System range capability subset	
		(This record must be present for radar systems (ICMB(N) = 0 or 1), but it is omitted with a counter-battery penetrator, standoff SLAR, or a penetrating system (ICMB(N) =2, 3, or 4).	
RNGE(N,1)	4-7	Maximum sensor range capability against target element type 1 for a sensor of system N.	F4.0
RNGE(N,2)	9-12	Maximum sensor range capability against target element type 2 for a sensor of system N.	F4.0
RNGE(N,3)	14-17	Maximum sensor range capability against target element type 3 for a sensor of system N.	F4.0
RNGE(N,4)	19-22	Maximum sensor range capability against target element type 4 for a sensor of system N.	F4.0
RNGE(N,5)	24-27	Maximum sensor range capability against target element type 5 for a sensor of system N.	F4.0

Table 2-4. System Data Set (System N)
(page 5 of 9 pages)

TADER name	Column	Entry	Format
		System inherent detection probability subset (one record per target element type; probability by sensor zone if NZFLAG 0, else by target zone)	
PDET(J,1,N)	1-4	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 1. The J-th record in this set is for element type J.	F4.0
PDET(J,2,N)	6-9	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 2.	F4.0
PDET(J,3,N)	11-14	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 3.	F4.0
PDET(J,4,N)	16-19	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 4.	F4.0
PDET(J,5,N)	21-24	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 5.	F4.0
PDET(J,6,N)	26-29	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 6.	F4.0
PDET(J,7,N)	31-34	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 7.	F4.0
PDET(J,8,N)	36-39	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 8.	F4.0
PDET(J,9,N)	41-44	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 9.	F4.0
PDET(J,10,N)	46-49	Single-sensor inherent probability of detection for sensor system N against a single target element of type J in sensor/target zone 10.	F4.0

Table 2-4. System Data Set (System N)
(page 6 of 9 pages)

TADER name	Column	Entry	Format
		System capability modifier subset/A=1, E=1 (one record per target element type; capability by sensor zone if NZFLAG 0, else by target zone)	
FC(J,1,N,1,1)	1-4	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 1. The J-th record in the set is for element type J.	F4.0
FC(J,2,N,1,1)	6-9	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 2.	F4.0
FC(J,3,N,1,1)	11-14	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 3.	F4.0
FC(J,4,N,1,1)	16-19	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 4.	F4.0
FC(J,5,N,1,1)	21-24	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 5.	F4.0
FC(J,6,N,1,1)	26-29	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 6.	F4.0
FC(J,7,N,1,1)	31-34	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 7.	F4.0
FC(J,8,N,1,1)	36-39	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 8.	F4.0
FC(J,9,N,1,1)	41-44	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 9.	F4.0
FC(J,10,N,1,1)	46-49	Multiplier of inherent probability of detection for system N against a moving target element (type J) in the open in sensor/target zone 10.	F4.0

Table 2-4. System Data Set (System N)
(page 7 of 9 pages)

TADER name	Column	Entry	Format
		System capability modifier subset/A=1, E=2 (one record per target element type; capability by sensor zone if NZFLAG 0, else by target zone)	
FC(J,1,N,1,2)	1-4	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 1. The J-th record in the set is for element type J.	F4.0
FC(J,2,N,1,2)	6-9	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 2.	F4.0
FC(J,3,N,1,2)	11-14	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 3.	F4.0
FC(J,4,N,1,2)	16-19	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 4.	F4.0
FC(J,5,N,1,2)	21-24	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 5.	F4.0
FC(J,6,N,1,2)	26-29	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 6.	F4.0
FC(J,7,N,1,2)	31-34	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 7.	F4.0
FC(J,8,N,1,2)	36-39	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 8.	F4.0
FC(J,9,N,1,2)	41-44	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 9.	F4.0
FC(J,10,N,1,2)	46-49	Multiplier of inherent probability of detection for system N against a moving target element (type J) in woods or towns in sensor/target zone 10.	F4.0

Table 2-4. System Data Set (System N)
(page 8 of 9 pages)

TADER name	Column	Entry	Format
		System capability modifier subset/A=2, E=1 (one record per target element type; capability by sensor zone if NZFLAG 0, else by target zone)	
FC(J,1,N,2,1)	1-4	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 1. The J-th record in the set is for element type J.	F4.0
FC(J,2,N,2,1)	6-9	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 2.	F4.0
FC(J,3,N,2,1)	11-14	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 3.	F4.0
FC(J,4,N,2,1)	16-19	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 4.	F4.0
FC(J,5,N,2,1)	21-24	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 5.	F4.0
FC(J,6,N,2,1)	26-29	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 6.	F4.0
FC(J,7,N,2,1)	31-34	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 7.	F4.0
FC(J,8,N,2,1)	36-39	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 8.	F4.0
FC(J,9,N,2,1)	41-44	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 9.	F4.0
FC(J,10,N,2,1)	46-49	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in the open in sensor/target zone 10.	F4.0

Table 2-4. System Data Set (System N)
(page 9 of 9 pages)

TADER name	Column	Entry	Format
		System capability modifier subset/A=2, E=2 (one record per target element type; capability by sensor zone if NZFLAG 0, else by target zone)	
FC(J,1,N,2,2)	1-4	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 1. The J-th record in the set is for element type J.	F4.0
FC(J,2,N,2,2)	6-9	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 2.	F4.0
FC(J,3,N,2,2)	11-14	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 3.	F4.0
FC(J,4,N,2,2)	16-19	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 4.	F4.0
FC(J,5,N,2,2)	21-24	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 5.	F4.0
FC(J,6,N,2,2)	26-29	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 6.	F4.0
FC(J,7,N,2,2)	31-34	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 7.	F4.0
FC(J,8,N,2,2)	36-39	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 8.	F4.0
FC(J,9,N,2,2)	41-44	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 9.	F4.0
FC(J,10,N,2,2)	46-49	Multiplier of inherent probability of detection for system N against a stationary target element (type J) in woods or towns in sensor/target zone 10.	F4.0

(3) The composition of the sensor employment subset and the coverage subset depends on the value of ICMB(N), the system type for system N. Table 2-5 summarizes all required entries and records needed for each system N case type. Entries not listed are not needed for that case. Format details are provided in Table 2-4.

Table 2-5. Data Requirements - Employment Subset/Coverage Subset

System N case type	Employment subset requirements	Coverage subset requirements
ICMB(N) = 0,1 (STANO radar fwd observer	NSYS(N), STB(N), THEA(N)	Subset omitted if STB(N) 1000. If STB(N) 1000, this set has one record for each emplaced sensor. Each I-th record has entries RT(I, N), VPEN(I, N), HPEN(I, N), and UPEN(I, N).
ICMB(N)=2,4 (penetrating system)	NPIECE(N)	One record for each coverage rectangle in coverage pattern. Each I-th record has entries RT(I, N), VPEN(I, N), HPEN(I, N), and UPEN(I, N).
ICMB(N)=3 (Standoff SLAR)	NSYS(N), STB(N), SRANGE	None - This subset is omitted.

c. **Unit Data Set.** Table 2-6 describes this set which consists of two data subsets for each target unit type. The total number of records in the set for each unit type is (NZONE + 5 x IELT). This set describes the composition (number of elements of each type) of each target unit. The data subsets for units IU = 1, . . . NUMU are sequentially entered immediately following all of the system data sets. One record is required for each target zone and five records are required for each target element type. Records are entered in order of zone or element type.

d. **Data Source References**

(1) Sensors. Most of the data on sensor characteristics and degradation factors used by the TAS III team come from the TAS II technical paper referenced earlier. Other sources of sensor data are:

(a) Reconnaissance, Surveillance and Target Acquisition (RSTA) Systems and Technologies Tactical Operations (U), MITRE Corporation, MTR-7583 June 1977 (SECRET)

(b) Visionics EO Sensor Performance Handbook, Defense Intelligence Agency DDP-2600-3139-85 Sep 1985 (SECRET)

(c) Handbook on Target Acquisition in Support of Indirect Fire, First Edition USAMSAA Handbook 6 Nov 1987 (SECRET-NOFORN)

(2) Targets. While target data is also available from the TAS II report, the TAS III team worked with the principal user (NUREQ-92) of the output POTA values to ascertain the target unit types of concern and their locations (by target zone), TOEs, lucrativeness threshold values, and other characteristics required by the model.

Table 2-6. Unit Data Set Format (Unit IU)
(page 1 of 6 pages)

TADER name	Column	Entry	Format[(1)]
		Troop posture subset (one record per target zone in zone order)	
IOMIT(IU)	1-3	Read only on first card (target zone 1) of the Unit Data Set. If IOMIT(IU) is less than zero, unit IU is not processed. Otherwise it is.	I3
TPOS(1,K,IU)	4-7	Posture 1 factor. The fraction of personnel of unit IU to be found standing exposed in target zone K.	F4.0
UID(IU)	23-25	Read only on first card of the Unit Data Set. Label for unit.	A3
		Target element descriptor subset (one record per target element type J in element type order)	
		Target element quantity card	
IQET(J,1,IU)	2-4	Quantity of target elements of type J for unit type IU expected to be in target zone 1.	I3
IQET(J,2,IU)	6-8	Quantity of target elements of type J for unit type IU expected to be in target zone 2.	I3
IQET(J,3,IU)	10-12	Quantity of target elements of type J for unit type IU expected to be in target zone 3.	I3
IQET(J,4,IU)	14-16	Quantity of target elements of type J for unit type IU expected to be in target zone 4.	I3
IQET(J,5,IU)	18-20	Quantity of target elements of type J for unit type IU expected to be in target zone 5.	I3
IQET(J,6,IU)	22-24	Quantity of target elements of type J for unit type IU expected to be in target zone 6.	I3
IQET(J,7,IU)	26-28	Quantity of target elements of type J for unit type IU expected to be in target zone 7.	I3
IQET(J,8,IU)	30-32	Quantity of target elements of type J for unit type IU expected to be in target zone 8.	I3

(1)The format F4.0 is used to read input fractions because a decimal in a field overrides the decimal placement implied in an input format statement. The user must enter the decimal point for some input entries read under a F4.0 format.

Table 2-6. Unit Data Set Format (Unit IU)
(page 2 of 6 pages)

TADER name	Column	Entry	Format
		Target element quantity card (cont)	
IQET(J,9,IU)	34-36	Quantity of target elements of type J for unit type IU expected to be in target zone 9.	I3
IQET(J,10,IU)		38-40 Quantity of target elements of type J for unit type IU expected to be in target zone 10.	I3
TPCT(J)	41-43	TPCT(J) is the "OR" lucrativeness fraction for element type J. These are separately applied to each element type in unit IU in all target zones.	F3.2
TPCT1(J)	44-46	This input applies only for element type J=2 or 3 (wheeled or tracked vehicles). TPCT1(J) is the "AND" lucrativeness fraction for element type J. These are jointly applied in unit IU in all target zones.	F3.2
ITRBP(J)	44-46	This input applies only for element type J=4 or 5 (arty/rocket or mortars). ITRBP(J) is the lucrativeness threshold for volleys fired from all elements of type J in all target zones for unit IU.	13
IRPS(J)	47-49	This input applies only for element type J=4 or 5 (arty/rocket or mortars) . IRPS(J) is the number of rounds fired per volley by an element of type J in unit IU.	13
		(The following inputs apply only for J=4 or 5.)	
PFIR(J,1)	50-52	Fraction of units of type IU firing in target zone 1.	F3.1
PFIR(J,2)	53-55	Fraction of units of type IU firing in target zone 2.	F3.1
PFIR(J,3)	56-58	Fraction of units of type IU firing in target zone 3.	F3.1
PFIR(J,4)	59-61	Fraction of units of type IU firing in target zone 4.	F3.1
PFIR(J,5)	62-64	Fraction of units of type IU firing in target zone 5.	F3.1
PFIR(J,6)	65-67	Fraction of units of type IU firing in target zone 6.	F3.1
PFIR(J,7)	68-70	Fraction of units of type IU firing in target zone 7.	F3.1
PFIR(J,8)	71-73	Fraction of units of type IU firing in target zone 8.	F3.1
PFIR(J,9)	74-76	Fraction of units of type IU firing in target zone 9.	F3.1
PFIR(J,10)	77-79	Fraction of units of type IU firing in target zone 10.	F3.1

Table 2-6. Unit Data Set Format (Unit IU)
(page 3 of 6 pages)

TADER name	Column	Entry	Format
		Target element activity/environment card (A=1, E=1) The sum of corresponding fields, i.e., for the same element type and zone, must equal 1.00 over the (A, E) states).	
FACT(1,1,J,1, IU)	1-4	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 1.	F4.0
FACT(1,1,J,2, IU)	5-8	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 2.	F4.0
FACT(1,1,J,3, IU)	9-12	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 3.	F4.0
FACT(1,1,J,4, IU)	13-16	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 4.	F4.0
FACT(1,1,J,5, IU)	17-20	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 5.	F4.0
FACT(1,1,J,6, IU)	21-24	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 6.	F4.0
FACT(1,1,J,7, IU)	25-28	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 7.	F4.0
FACT(1,1,J,8, IU)	29-32	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 8.	F4.0

Table 2-6. Unit Data Set Format (Unit IU)
(page 4 of 6 pages)

TADER name	Column	Entry	Format
FACT(1,1,J,9, IU)	33-36	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 9.	F4.0
FACT(1,1,J,10, IU)	37-40	The fraction of target element type J expected to be found moving in the open in unit IU in target zone 10.	F4.0
ISAL(J,K) K=1, 10	41-80	Number of arty/missile volleys fired in unit IU in target zone K by the cluster of elements of type J. This input applies only for J=4 or 5.	10I4
		Target element activity/environment card (A=1, E=2)	
FACT(1,2,J,1, IU)	1-4	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 1.	F4.0
FACT(1,2,J,2, IU)	5-8	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 2.	F4.0
FACT(1,2,J,3, IU)	9-12	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 3.	F4.0
FACT(1,2,J,4,IU)	13-16	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 4.	F4.0
FACT(1,2,J,5, IU)	17-20	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 5.	F4.0
FACT(1,2,J,6, IU)	21-24	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 6.	F4.0
FACT(1,2,J,7, IU)	25-28	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 7.	F4.0

Table 2-6. Unit Data Set Format (Unit IU)
(page 5 of 6 pages)

TADER name	Column	Entry	Format
FACT(1,2,J,8, IU)	29-32	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 8.	F4.0
FACT(1,2,J,9, IU)	33-36	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 9.	F4.0
FACT(1,2,J,10, IU)	37-40	The fraction of target element type J expected to be found moving in towns or wooded areas in unit IU in target zone 10.	F4.0
		Target element activity/environment card (A=2,E=1)	
FACT(2,1,J,1, IU)	1-4	The fraction of target element type J found stationary in unit IU in the open in target zone 1.	F4.0
FACT(2,1,J,2, IU)	5-8	The fraction of target element type J found stationary in unit IU in the open in target zone 2.	F4.0
FACT(2,1,J,3, IU)	9-12	The fraction of target element type J found stationary in unit IU in the open in target zone 3.	F4.0
FACT(2,1,J,4, IU)	13-16	The fraction of target element type J found stationary in unit IU in the open in target zone 4.	F4.0
FACT(2,1,J,5, IU)	17-20	The fraction of target element type J found stationary in unit IU in the open in target zone 5.	F4.0
FACT(2,1,J,6, IU)	21-24	The fraction of target element type J found stationary in unit IU in the open in target zone 6.	F4.0
FACT(2,1,J,7, IU)	25-28	The fraction of target element type J found stationary in unit IU in the open in target zone 7.	F4.0
FACT(2,1,J,7, IU)	29-32	The fraction of target element type J found stationary in unit IU in the open in target zone 8.	F4.0
FACT(2,1,J,9, IU)	33-36	The fraction of target element type J found stationary in unit IU in the open in target zone 9.	F4.0
FACT(2,1,J,10, IU)	37-40	The fraction of target element type J found stationary in unit IU in the open in target zone 10.	F4.0

Table 2-6. Unit Data Set Format (Unit IU)
(page 6 of 6 pages)

TADER name	Column	Entry	Format
		Target element activity/environment card (A=2,E=2)	
FACT(2,2,J,1, IU)	1-4	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 1.	F4.0
FACT(2,2,J,2, IU)	5-8	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 2.	F4.0
FACT(2,2,J,3, IU)	9-12	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 3.	F4.0
FACT(2,2,J,4, IU)	13-16	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 4.	F4.0
FACT(2,2,J,5, IU)	17-20	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 5.	F4.0
FACT(2,2,J,6, IU)	21-24	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 6.	F4.0
FACT(2,2,J,7, IU)	25-28	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 7.	F4.0
FACT(2,2,J,8, IU)	29-32	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 8.	F4.0
FACT(2,2,J,9, IU)	33-36	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 9.	F4.0
FACT(2,2,J,10, IU)	37-40	The fraction of this target element found stationary in unit IU in towns or wooded areas in zone 10.	F4.0

2-6. INPUT DATA EXAMPLE. Figure 2-2 shows a sample TADER input data base for a case with two sensor systems, one target unit, five target zones, and five sensor zones. The run ID is UX800 and the following remarks apply:

a. Sensor system one has alphabetic label A, and is comprised of 12 STANO radars uniformly spaced at a standoff of one km from the FLOT. The sensor scan angle is 90 degrees (1.57 radians).

b. Sensor system two has alphabetic label B, and consists of two standoff SLAR missions at a standoff of 25 km from the FLOT. (Both missions have the same path and traverse the sector once).

c. The target unit has alphabetic label 1A and consists of wheeled vehicles, tracked vehicles, and mortars. Ordinarily, the unit would also have personnel; hence nonzero values of personnel attributes are included in the input data and target description tables although the personnel TOE is set to zero.

d. The binomial distribution is approximated by the normal if the number of target elements in a target unit exceeds 100 for an element type.

This data base is described in more detail in the the output of the data display processor, which is discussed in the next paragraph.

```
Ux800   .00  100     1      1
  1  5  2  5  1  1  5        1
1.001.00
 130       3.    12.    25.  100.  300.     0.     0.     0.     0.     0.
    1      1      1      1      2
   1.     1.     1.     5.     5.
    3.    12.    25.  100.  400.     0.     0.     0.     0.     0.
     .90 1.00   .80   0 A.  .95
 .50   .40   .00   .00   .00   .00   .00   .00   .00   .00
  12 1.000 1.570  1.00        1
  .95    .70
     8.   12.   12.    0.     0.
 .50   .40   .00   .00   .00   .00   .00   .00   .00   .00
 .75   .65   .00   .00   .00   .00   .00   .00   .00   .00
 .90   .75   .00   .00   .00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
1.00  1.00  0.00  0.00  0.00   .00   .00   .00   .00   .00
1.00  1.00  0.00  0.00  0.00   .00   .00   .00   .00   .00
1.00  1.00  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
 .20   .20  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .20   .20  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .20   .20  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
 .80   .80   .00   .00   .00   .00   .00   .00   .00   .00
 .80   .80   .00   .00   .00   .00   .00   .00   .00   .00
 .80   .80   .00   .00   .00   .00   .00   .00   .00   .00
 .00   .00  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
 .40   .40   .00   .00   .00   .00   .00   .00   .00   .00
 .40   .40   .00   .00   .00   .00   .00   .00   .00   .00
 .40   .40   .00   .00   .00   .00   .00   .00   .00   .00
 .00   .00  0.00  0.00  0.00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
    1.0   .90   1.0   3 B.  1.0
 .90   .85   .80   .70   .50   .00   .00   .00   .00   .00
  2 25.00   .000 1.000       1   100.
 .900    .99
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
1.0    .99   .90   .60   .50   .00   .00   .00   .00   .00
1.0    .99   .90   .60   .50   .00   .00   .00   .00   .00
 .55   .45   .00   .00   .00   .00   .00   .00   .00   .00
 .55   .45   .00   .00   .00   .00   .00   .00   .00   .00
 .82   .82   .82   .82   .82   .82    82   .82   .82   .82
  82   .82   .82   .82   .82   .00   .00   .00   .00   .00
 .82   .82   .82   .82   .82   .00   .00   .00   .00   .00
```

Figure 2-2. Example TADER Input Data Base
(page 1 of 2 pages)

```
.82  .82  .82  .82  .82  .32  .82  .82  .82  .82
 82  .82  .82  .82  .82  .82  .82   82   82  .82
.40  .40  .40  .40  .40  .40  .40  .40  .40  .40
.40  .40  .40  .40  .40  .40  .40  .40  .40  .40
.40  .40  .40  .40  .40  .40  .40  .40  .40  .40
.40  .40  .40  .40  .40  .40  .40  .40  .40  .40
.40  .40  .40  .40  .40  .40  .40  .40  .40  .40
.20  .20  .20  .20  .20  .20  .20  .20  .20  .20
.20  .20  .20  .20  .20  .20  .20  .20  .20  .20
.20  .20  .20  .20  .20  .20  .20  .20  .20  .20
.20  .20  .20  .20  .20  .20  .20  .20  .20  .20
.20  .20  .20  .20  .20  .20  .20  .20  .20  .20
.10  .10  .10  .10  .10  .00  .00  .00  .00  .00
.10  .10  .10  .10  .10  .00  .00  .00  .00  .00
.10  .10  .10  .10  .10  .00  .00  .00  .00  .00
.10  .10  .10  .10  .10  .00  .00  .00  .00  .00
.10  .10  .10  .10  .10  .00  .00  .00  .00  .00
   .00  .00  .00  .00 1A
   .00  .00  .00  .00
   .00  .00  .00  .00
   .40  .00  .00  .00
   .50  .00  .00  .00
000 000 000 000 000                     .50
.00 .00 .00 .15 .15
.00 .00 .00 .40 .40
.00 .00 .00 .05 .05
.00 .00 .00 .40 .40
 12  12  12  12  12                     .25.12
.05 .05 .05 .05 .05
.05 .05 .05 .05 .05
.10 .10 .10 .10 .10
.80 .80 .80 .80 .80
 32  32  32  32  32                     .25.12
.05 .05 .05 .05 .05
.05 .05 .05 .05 .05
.10 .10 .10 .10 .10
.80 .80 .80 .80 .80
  0   0   0   0   0                     .40  0   0 0.  0.  0.  0.  0.
.00 .00 .00 .15 .15                        0   0    0    0    0
.00 .00 .00 .15 .15
.00 .00 .00 .00 .00
.00 .00 .00 .70 .70
  8   8   0   0   0                     .25  1   8.95.70 0.  0.  0.
.05 .05 .00 .00 .00                       60  40    0    0    0
.05 .05 .00 .00 .00
.10 .10 .00 .00 .00
.80 .80 .00 .00 .00
```

Figure 2-2. Example TADER Input Data Base
(page 2 of 2 pages)

2-7. DATA BASE DISPLAY PROCESSOR. Prior to executing the TADER model, the user may execute the data display processor in order to generate a readable display of input with headings. The TADER input must be preceded by supplemental card image input, described in Table 2-7. The source code for the data display processor is shown in Appendix B.

Table 2-7. Supplemental Card Image Input to the Data Display Processor

TADER name	Column	Entry	Format
Record 1			
NSEN	1-2	Number of sensor systems	I2
NUMU	3-4	Number of target units	I2
Record group 2			
TID(I), I=1, NSEN	1-80	Alphabetic name of system I (one record for each sensor system)	8A10
Record group 3			
UNAME(I), I=1, NUMU	1-80	Alphabetic name of target unit I (one record for each target unit type)	8A10
Record group 4			
ZLAB(I), I=1, 10	1-80	Alphabetic name of target zone (one record per target zone)	10A8

An example of the supplemental card image input is shown in Figure 2-3. The example input is applied to the input data of Figure 2-2. The case has two sensor systems, a STANO radar (identified as SYSTEM 1) and a standoff SLAR (identified as SYSTEM 2). There is only one target unit (labeled UNIT 1A). Labels for 10 target zones are given, though only 5 are used in this case. When applied with the data base of Figure 2-2, the data display processor formats and labels the input data in the following output tables:

```
 2 1
  SYSTEM 1  SYSTEM 2
   UNIT 1A
  ZONE 1   ZONE 2   ZONE 3   ZONE 4   ZONE 5   ZONE 6   ZONE 7   ZONE 8   ZONE 9   ZONE10
```

Figure 2-3. Example Supplemental Input to Data Display Processor

a. Target Zone Data Display. This display is shown in Figure 2-4 and shows:

(1) The sector width (ISWD) in km.

(2) The furthest boundary (distance, in km, from FLOT) of each target zone K (ZD(K)).

(3) For each sensor zone, the distance (km) from an emplaced sensor to the far boundary of each sensor zone.

(4) The fraction of each target zone processed, based on every N-th row, where N=IAVG(K).

(5) The size (side length in km = XAVG(K)) of a grid square in each target zone K.

```
           *** TARGET ZONE STRUCTURE ***

SECTOR
 WIDTH   ZONE 1   ZONE 2   ZONE 3   ZONE 4   ZONE 5

  130       3.       12.       25.     100.     300.

          *** SENSOR ZONE STRUCTURE ***


  ZONE 1   ZONE 2   ZONE 3   ZONE 4   ZONE 5

     3.0     12.0     25.0    100.0    400.0

          ** FRACTION (FRAC) OF TGT ZONE SAMPLED BASED ON EVERY N-TH  STRIP IN ZONE
           ZONE 1   ZONE 2   ZONE 3   ZONE 4   ZONE 5

FRAC =       1.00     1.00     1.00     1.00      .50
   N =          1        1        1        1        2

           SIZE OF GRID SQUARE IN EACH TARGET ZONE
           ZONE 1   ZONE 2   ZONE 3   ZONE 4   ZONE 5
              1.0      1.0      1.0      5.0      5.0
```

Figure 2-4. Target Zone Data Display

b. Artillery/Missile Firing Factor Data Display. This display, in Figure 2-5, shows, for each target unit with firing artillery or mortars:

(1) The rounds fired per volley (IRPS(J)).

(2) The lucrativeness threshold in terms of minimum number of volleys required to be detected for a lucrative detection (ITRBP(J)). This is under MIN SAL TO DET.

(3) The type of firer (under the ELT column), either artillery/missile (ELT type J=4) or mortar (ELT type J=5).

(4) The fraction of target units of this type (1A) which are firing element type J in target zone K during the search period (PFIR(J,K)).

(5) The total volleys fired by the entire battery in a firing unit in the zone during the search period (IRPS(J)).

*** ARTY/MISSILE FIRING FACTORS ***

UNIT	RDS/ VOLLY	MIN SAL TO DET	ELT	** FRAC UNITS FIRING / VOLLEYS FIRED BY BATTERY *** ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
1A	8	1	-5-	.95/ 60	.70/ 40	.00/ 0	.00/ 0	.00/ 0

Figure 2-5. Artillery/Missile Firing Factor Data Display

c. Lucrativeness Threshold/TOE Data Display. This display in Figure 2-6 shows, for each target unit:

(1) The 'AND' lucrativeness fraction for each element type J=2 or 3 (TPCT1(J)).

(2) The 'OR' lucrativeness fraction for each element type J(TPCT(J)).

(3) The TOE for each element type in each target zone. (IQET(J,K,IU)).

** LUCR THRESHOLD & QUANTITY OF ELEMENTS (TOE) IN UNIT FOR EACH TARGET ZONE **

UNIT ID		LUCRATIVENESS FRACTIONS ('AND')	('OR')	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
1A								
	ELT = 1		.50	000	000	000	000	000
	ELT = 2	.12	.25	12	12	12	12	12
	ELT = 3	.12	.25	32	32	32	32	32
	ELT = 4		.40					
	ELT = 5		.25	8	8			

Figure 2-6. Lucrativeness Threshold/TOE Data Display

Note that TOE values for artillery/missile are in terms of carriers or launchers. The input of paragraph 2-7.b separately accounts for firings.

d. Sensor Employment Characteristics Data Display. This display in Figure 2-7 shows, for every sensor system N, where SYSTEM N refers to the N-th sensor system input:

(1) The TADER alphabetic label (SID(N)) for system N. This is immediately after the SYSTEM N label.

(2) The system type (ICMB(N)) and its description.

(3) The number of sensors deployed in the system (NSYS(N)). This is not used for penetrating systems or counterbattery penetrator systems.

(4) The standoff (km) from the FLOT for each sensor (STB(N)). If this is at least 1,000 for a STANO radar or forward observer, it means that sensor locations are individually input; else they are set to uniform spacing at the specified standoff.

(5) The scan angle, in radians (THEA(N)) and degrees. This is only used for STANO radars and forward observers (ICMB(N) = 0 or 1).

(6) NPIECE(N) - number of rectangular pieces in the coverage pattern for SLAR, penetrating system, or counterbattery penetrator systems. It is not used with STANO radars or forward observer.

(7) The sensor range (km) against each element type (RNGE(N,J)) for STANO radars, forward observers and standoff SLAR only. It is not used (or input) with penetrating systems or counterbattery penetrator systems.

```
          *** SENSOR EMPLOYMENT CHARACTERISTICS ***


                                      DEPLOYED   SENSOR  SCAN ANGLE NR PIECES IN
                         SYSTEM TYPE   SYSTEMS  STANDOFF  RADN/DEGR COVG PATTERN


SYSTEM    1/ A.   0 = STANO RADAR          12      1.00 1.57/  90.            0
SYSTEM    2/ B.   3 =STANDOFF SLAR          2     25.00  .00/   0.            2

              *** SENSOR RANGE FOR ELEMENT TYPE ***

                    1     2     3     4     5

SYSTEM    1/ A.      8.   12.   12.    0.    0.
SYSTEM    2/ B.    100.  100.  100.  100.  100.
```

Figure 2-7. Sensor Employment Characteristics Data Display

e. Penetrating System Coverage Data Display. This display in Figure 2-8 shows, for each system N which is a penetrating system or counter-battery penetrator system, and for each rectangular piece, NP, in the coverage pattern of that system:

(1) The piece ID (NP) appears under RECT PIECE.

(2) The (X,Y) coordinates of the lower left corner of piece NP in a coordinate system with the X-axis on the FLOT (RT(NP,N) and VPEN(NP,N)).

(3) The X-dimension and Y-dimension of piece NP (in km) (HPEN(NP,N) and UPEN(NP,N)).

*** COVERAGE PATTERN INPUT FOR PENETRATING /CBTRY ACOUSTIC SYS

		RECT PIECE	LL CORNER X-COORD	LL CORNER Y-COORD	WIDTH X-DIM	DEPTH Y-DIM
SYSTEM	2/ B.	1	.00	.00	130.00	75.00
		2	.00	.00	130.00	75.00

Figure 2-8. Penetrating System Coverage Data Display

If a STANO radar or forward observer has an input standoff of 1,000 or more, this acts as a flag that individual sensor locations are to be input in the coverage subset. In such a case, the X-coord and Y-coord entries in this display show the X- and Y- coordinates of each sensor location. The sensor ID (numbering in the system) appears under RECT PIECE in such a case.

f. System Inherent Detection Probability Data Display. This display in Figure 2-9 shows, for every SYSTEM N, and for every element type J: the single-sensor/single-element detection probability, under ideal (base) conditions, as a function of sensor zone (PDET(G,K,N)).

*** SYSTEM INHERENT DETECTION PROBABILITIES ***

		ELT	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
SYSTEM	1/ A.	1	.50	.40			
		2	.75	.65			
		3	.90	.75			
		4					
		5					

		ELT	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
SYSTEM	2/ B.	1					
		2	1.0	.99	.90	.60	.50
		3	1.0	.99	.90	.60	.50
		4	.55	.45			
		5	.55	.45			

Figure 2-9. System Inherent Detection Probability Data Display

g. **Motion/Concealment Factor Data Display.** This display in Figure 2-10 and Figure 2-11 shows, for each sensor system, the multiplier applied to adjust inherent detection probability when a target element of specified type is in a specified activity/environment state in a specified sensor zone (FC(J,L,N,IA,IE)).

*** MOTION & CONCEALMENT DEGR FACTORS FOR INHERENT SYSTEM DETECTION PROB ***

STATE 1= MOVING/IN THE OPEN
STATE 2=MOVING/NOT IN OPEN
STATE 3=STATIONARY/IN THE OPEN
STATE 4=STATIONARY/NOT IN OPEN

SYSTEM	ELT	STATE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
1/ A.	1	1	1.00	1.00			
1/ A.	1	2	.20	.20			
1/ A.	1	3	.80	.80			
1/ A.	1	4	.40	.40			
1/ A.	2	1	1.00	1.00			
1/ A.	2	2	.20	.20			
1/ A.	2	3	.80	.80			
1/ A.	2	4	.40	.40			
1/ A.	3	1	1.00	1.00			
1/ A.	3	2	.20	.20			
1/ A.	3	3	.80	.80			
1/ A.	3	4	.40	.40			
1/ A.	4	1					
1/ A.	4	2					
1/ A.	4	3					
1/ A.	4	4					
1/ A.	5	1					
1/ A.	5	2					
1/ A.	5	3					
1/ A.	5	4					

Figure 2-10. Motion/Concealment Factor Data Display for System 1

SYSTEM	ELT	STATE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
2/ B.	1	1	.82	.82	.82	.82	.82
2/ B.	1	2	.40	.40	.40	.40	.40
2/ B.	1	3	.20	.20	.20	.20	.20
2/ B.	1	4	.10	.10	.10	.10	.10
2/ B.	2	1	.82	.82	.82	.82	.82
2/ B.	2	2	.40	.40	.40	.40	.40
2/ B.	2	3	.20	.20	.20	.20	.20
2/ B.	2	4	.10	.10	.10	.10	.10
2/ B.	3	1	.82	.82	.82	.82	.82
2/ B.	3	2	.40	.40	.40	.40	.40
2/ B.	3	3	.20	.20	.20	.20	.20
2/ B.	3	4	.10	.10	.10	.10	.10
2/ B.	4	1	.82	.82	.82	.82	.82
2/ B.	4	2	.40	.40	.40	.40	.40
2/ B.	4	3	.20	.20	.20	.20	.20
2/ B.	4	4	.10	.10	.10	.10	.10
2/ B.	5	1	.82	.82	.82	.82	.82
2/ B.	5	2	.40	.40	.40	.40	.40
2/ B.	5	3	.20	.20	.20	.20	.20
2/ B.	5	4	.10	.10	.10	.10	.10

Figure 2-11. Motion/Concealment Factor Data Display for System 2

h. System Degradation Factor Data Display. This display in Figure 2-12 shows, for each sensor system, the input multiplier (of inherent detection probability) applied for each environmental factor in each target zone.

*** SYSTEM DEGRADATION FACTORS ***

*** DEFINITION OF TERMS ***

S=SYSTEM ID
K=TARGET ZONE
PWEA(S)=PROB OF NO SENSOR DEGRADATION BY WEATHER
PSMO(S)=PROB OF NO SENSOR DEGRADATION BY SMOKE
PCPF(S)=PROB OF NO SENSOR DEGRADATION BY UNSATISFACTORY CREW PERF
PVIS(K,S)=PROB OF UNOBSTRUCTED LINE OF SIGHT TO A TGT IN TGT ZONE K

SYSTEM	TZONE	PWEA(S) X	PWIND(S) X	PSMO(S) X	PCPF(S) X	PVIS(K,S) =	PDEC(K,S)
1/ A.	I	.90	.95	1.00	.80	.50	.342
	II	.90	.95	1.00	.80	.40	.274
	III	.90	.95	1.00	.80	.00	.000
	IV	.90	.95	1.00	.80	.00	.000
	V	.90	.95	1.00	.80	.00	.000
2/ B.	I	1.00	1.00	.90	1.00	.90	.810
	II	1.00	1.00	.90	1.00	.85	.765
	III	1.00	1.00	.90	1.00	.80	.720
	IV	1.00	1.00	.90	1.00	.70	.630
	V	1.00	1.00	.90	1.00	.50	.450

Figure 2-12. System Degradation Factor Data Display

i. System Availability/Survival Factor Data Display. This display in Figure 2-13 shows, for each sensor system the input multiplier for (probability of) sensor availability and survival during the search period.

```
*** SYSTEM AVAILABILITY/SURVIVAL FACTORS ***

    *** DEFINITION OF TERMS ***


    S=SYSTEM ID
    FA(S)=PROB SENSOR IS AVAILABLE(AVAILABILITY)
    FS(S)=PROB SENSOR SURVIVES(SURVIVABILITY)
    PA(S)= (COMBINED)PROB SENSOR IS AVAILABLE & SURVIVES

SYSTEM    FA(S) X FS(S) = PA(S)

 1/ A.      .95       .70       .665

 2/ B.      .90       .99       .891
```

Figure 2-13. System Availability/Survival Factor Data Display

j. Personnel Posture Factor Data Display. This display, in Figure 2-14 shows, for target unit in each target zone, the fraction of personnel in that unit who are in a standing posture (TPOS(1,K,IU)).

```
  *** PERSONNEL POSTURE FACTORS ***

TGTZONE --- FRACTION (OF TOT PERS) STANDING IN TARGET ZONE ---


            1A

     I
    II
   III
    IV    .40
     V    .50
```

Figure 2-14. Personnel Posture Factor Data Display

k. Activity/Environment Frequency Data Display. This display in Figure 2-15 shows, for each element type in each unit in each target zone, the probability of that element type being in each activity/environment state (FACT(IA,IE,J,K,IU)).

*** FRACTION TIME ELEMENT TYPE IS IN EACH ACTIVITY/ENVIRONMENT STATE ***

STATE 1= MOVING/IN THE OPEN
STATE 2=MOVING/NOT IN OPEN
STATE 3=STATIONARY/IN THE OPEN
STATE 4=STATIONARY/NOT IN OPEN

UNIT	ELT	STATE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5
1A	1	1				.15	.15
1A	1	2				.40	.40
1A	1	3				.05	.05
1A	1	4				.40	.40
1A	2	1	.05	.05	.05	.05	.05
1A	2	2	.05	.05	.05	.05	.05
1A	2	3	.10	.10	.10	.10	.10
1A	2	4	.80	.80	.80	.80	.80
1A	3	1	.05	.05	.05	.05	.05
1A	3	2	.05	.05	.05	.05	.05
1A	3	3	.10	.10	.10	.10	.10
1A	3	4	.80	.80	.80	.80	.80
1A	4	1				.15	.15
1A	4	2				.15	.15
1A	4	3					
1A	4	4				.70	.70
1A	5	1	.05	.05			
1A	5	2	.05	.05			
1A	5	3	.10	.10			
1A	5	4	.80	.80			

Figure 2-15. Activity/Environment Frequency Data Display

CHAPTER 3

MODEL OUTPUT

3-1. TYPES OF OUTPUT. The output of a TADER base case is generated on two disc files (designated internally in TADER as Logical Unit 12 and Logical Unit 14) and a print output listing. The main purpose of the disc file outputs is to serve as input to two postprocessors, the dominant system postprocessor (which uses file 12) and the sort/count postprocessor (which uses file 14).

a. The dominant system postprocessor lists, for every target unit processed, the n most dominant systems, based on their single-system POTAs contributed to form the unit POTA. These are rank ordered by POTA value. Also listed are the 'single-system POTA vs element type' components of the unit POTA from each system. A detailed description of the dominant system postprocessor is contained in paragraph 3-6 and in Appendix C.

b. The sort/count postprocessor processes cases defined by specified upper and lower bounds for the single-system POTAs. For each case, there is output one or both of:

(1) A matrix showing the number of target units with single-system POTAs within the case bounds for each combination of system, target zone and element type.

(2) A matrix for each target zone/element type showing which system/unit combinations have single-system POTA values within case bounds.

A detailed description of the sort/count postprocessors is contained in paragraph 3-7 and in Appendix D.

c. Example output described in succeeding paragraphs is the result of a TADER execution with the example input data described in Chapter 2.

3-2. BASIC PRINT OUTPUT. The amount of printed output depends on settings of print control flags input in the scenario definition data set of the input data base. The basic (always present) output is a table showing a single POTA value for each combination of target unit and target zone. The tabulated value is the probability that at least one of the scenario sensor systems detects the specified unit, (randomly) located in the specified target zone, as lucrative. An example basic TADER output for the example data of Chapter 2 is shown in Figure 3-1 for a case with exactly one target unit. The page header also specifies the run ID and the sensor system scale factors (multipliers of inherent detection) used in the scenario. The applicability of these results is limited to the specific scenario used to generate them.

```
***** RUN ID= Ux800 *****

                                   ------ PDET MULTIPLIERS BY SYSTEM TYPE

    1    2    3    4    5    6    7    8    9   10   11   12   13   14

1.001.00


  UPDATED PROBABILITY OF OPERATIONAL DETECTION (POTA)

                            ZONE    ZONE    ZONE    ZONE    ZONE    ZONE
                              I      II      III     IV       V      VI

UNIT ID=    1A          .8362   .7928   .5746   .1095   .0000
```

Figure 3-1. Example Basic Print Output

3-3. SUPPLEMENTAL PRINT OUTPUT. Additional print output can be generated by setting inputs LUNIT and LTHR of the scenario definition set of TADER input. If LUNIT is set to a positive value, two tables of single-system POTAs are printed. If LTHR is set to a positive value, tables of (input) lucrativeness thresholds are printed.

a. **Basic Single-System POTA Results.** A tabulation of single-system POTAs is printed if LUNIT is greater than zero. An example tabulation is shown in Figure 3-2. These basic single-system POTA results are generated for each unit in the same system order as the order of input, i.e., all system 1 results followed by system 2 results, etc. The numeric and alphabetic labels for each system are in the system column. The type system, expressed as the value of ICMB(N) for system N, is shown under TYPE. The UNIT and ZONE columns show the target unit and target zone for which the results apply. A single-system unit POTA for a specific sensor system of the scenario, listed in the UNIT POTA column is the probability that at least one sensor of that system detects the target unit as lucrative. It is a component of the overall unit POTA (shown in Figure 3-1). To give an indication of the detectability of element clusters within the target unit, the table also gives single-system POTAs restricted to a single element type and a specified type of lucrativeness. The entries in Figure 3-2 headed PROB UNIT IS LUCR ("OR" THRESH) show, for a specific element type, what the single-system unit POTA would be if the unit contained only the elements of the specified type and only the "OR" lucrativeness criterion were applied. The entries headed "AND THRESH" are exactly analogous, except that they are for only the "AND" lucrativeness threshold being applied. These "element type" POTAs cannot be directly combined to determine the unit POTA, but they provide a useful indication of the contribution of each system and element type to each overall unit POTA in the basic output.

***** RUN ID= Ux800 *****

------ POST MULTIPLIERS BY SYSTEM TYPE -----

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 001 00

RUN ID= Ux800 ***** ORDERED POTA FOR EACH SYSTEM VS UNIT 1A *****

SYSTEM	TYPE	UNIT	ZONE	POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	ELT 2	ELT 3
1/ A.	0	1A	1	1469	.0000	.0395	.0180	0000	0000	1911	1676
1/ A.	0	1A	2	.1815	.0000	.0469	0057	0000	0000	3996	2321
1/ A.	0	1A	3	0000	.0000	.0000	0000	.0000	0000	0000	0000
1/ A.	0	1A	4	0000	.0000	.0000	.0000	.0000	0000	0000	0000
1/ A.	0	1A	5	.0000	.0000	.0000	.0000	0000	0000	0000	0000
2/ B.	3	1A	1	.8079	0000	3232	.0854	.0000	1830	9240	7957
2/ B	3	1A	2	.7468	.0000	2839	0809	0000	1189	9133	7480
2/ B	3	1A	3	.5746	.0000	.2059	0263	0000	0000	8799	6218
2/ B.	3	1A	4	.1095	0060	0383	.0006	0000	0000	4805	1429
2/ B.	3	1A	5	.0000	0000	.0000	0000	0000	0000	0000	0000

Figure 3-2. Example Basic Single-System POTA Output

b. Rank-ordered Single-System POTA Results. Each overall unit POTA of Figure 3-1 is approximately determined as a combination of component single-system unit POTAs. It is useful to list component POTAs in order of numeric magnitude. Such a ranked list is displayed as a separate table headed "ORDERED POTA FOR EACH SYSTEM VS UNIT." An example is shown in Figure 3-3. This table is printed if input LUNIT is greater than zero and contains the same results shown in the basic single-system POTA table. However, for each unit and target zone, single-system unit POTAs (in the SYSTEM POTA column) are listed in decreasing order of magnitude. In addition, for each single-system unit POTA in the list, an estimate of the cumulative effect of all systems from the top of the list through the given entry is also shown under the heading "CUM POTA." The "cumulative POTA" from the n most dominant systems is determined by:

$$\text{CUM POTA (n-th dominant system)} = 1 - (1-P1)(1-P2) \ldots (1-Pn)$$

where Pi = ith unit POTA entry in the ranked list for this unit/target zone.

***** RUN ID= Ux800 *****

------ PDET MULTIPLIERS BY SYSTEM TYPE -----

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

1.001.00

RUN ID= Ux800 +++++ ORDERED POTA FOR EACH SYSTEM VS. UNIT 1A +++++

SYSTEM	TYPE	UNIT	ZONE	SYSTEM POTA	CUM POTA	PROB UNIT IS LUCR ('OR' THRESH) ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	('AND' THRESH) ELT 2	ELT 3
2/ B	3	1A	1	.8079	.8079	.0000	.3232	.0854	.0000	.1830	.9240	.7957
1/ A	0	1A	1	.1469	.8362	.0000	.0395	.0180	.0000	.0000	.1911	.1676
2/ B	3	1A	2	.7468	7468	.0000	.2839	.0609	.0000	1189	.9123	7480
1/ A	0	1A	2	.1815	.7928	.0000	.0465	.0057	.0000	.0000	.3996	.2321
2/ B	3	1A	3	.5746	.5746	.0000	.2059	.0263	.0000	.0000	.8799	.6218
1/ A	0	1A	3	.0000	.5746	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2/ B	3	1A	4	.1095	.1095	.0000	.0383	.0006	.0000	.0000	.4805	.1429
1/ A	0	1A	4	.0000	.1095	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2/ B	3	1A	5	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1/ A	0	1A	5	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Figure 3-3. Example Rank-ordered Single-system POTA Output

The last "CUM POTA" entry in the example list is equal to the overall unit POTA in the basic print output (Figure 3-1). However, the agreement is not always so exact, because the "CUM POTA" procedure combines aggregated results (over many points in a target zone) into a final aggregated POTA result. The overall unit POTA in the basic print results is an average of unit POTAs calculated at many points in a zone. The "CUM POTA" entry is formed by the mathematical combination of single system POTAs, each of which is averaged over the target zone. Combinations at point resolution (the overall unit POTA) are more precise than combinations of entire aggregated at target zone level. The nth "CUM POTA" entry shows approximately what the overall unit POTA would be if only the n most dominant systems (for this unit/target zone) were present in the scenario.

3-4. LUCRATIVENESS THRESHOLDS. If LTHR in the scenario definition data set of TADER input is set to a positive value, then a table of TOE and lucrativeness fractions for each element type in each target unit is displayed. An example is shown in Figure 3-4. This table echoes input data. A table of thresholds for artillery/mortar element types in each unit is also printed. An example is shown in Figure 3-5. Artillery/mortar thresholds are input as minimum number of volleys required to be detected to assure detection of the battery (and unit).

```
*****  RUN ID= UX800  *****

** LUCR THRESHOLD & QUANTITY OF ELEMENTS (TOE) IN UNIT FOR EACH TARGET ZONE **

UNIT ID
              LUCRATIVENESS
                 FRACTIONS
              ('AND')  ('OR')   ZONE 1  ZONE 2  ZONE 3  ZONE 4  ZONE 5
  1A
       ELT = 1          .56       0       0       0       0       0
       ELT = 2   .12    .25      12      12      12      12      12
       ELT = 3   .12    .25      32      32      32      32      32
       ELT = 4          .40       0       0       0       0       0
       ELT = 5          .25       8       8       0       0       0
```

Figure 3-4. Example Lucrativeness Fraction/TOE Output

```
*****  RUN ID= UX800  *****

                 ------ PDET MULTIPLIERS BY SYSTEM TYPE -----

  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1.031.00

       ----- LUCRATIVENESS THRESHOLD (FOR ARTY/MORTARS SCANNED BY  COUNTERBTRY SYSTEMS)  ---

       LUCRATIVENESS THRESHOLDS(MIN VOLLEYS REQUIRED) BY'TGT  ZONE & ELT TYPE  ('OR' CONDITIONS)

** UNIT 1A
                      I    II   III   IV    V    VI   VII  VIII   IX    X
  MORTAR VOLLEYS      1    1     0     0    0
```

Figure 3-5. Example Artillery/Mortar Lucrativeness Threshold Output

3-5. DISC FILE OUTPUT. If input NOWRIT in the scenario definition data set of TADER input is set to a positive value, TADER output is also written on logical units 12 and 14 for use as input to the two postprocessors. If NOWRIT is set to zero or a negative value, nothing is written on logical units 12 or 14, and the postprocessors cannot be executed. The structure and format of these disc file outputs is as follows:

a. Logical Unit 12. Logical unit 12 is intended only for use as input to the Dominant System Postprocessor. The structure of the TADER output on logical unit 12 is shown in Table 3-1. The file organization, description and output format are shown in Tables 3-2 and 3-3. An example of output is displayed in Figure 3-6. Elaborating remarks include:

Table 3-1. Structure of TADER Output on Logical Unit 12

Run specification record
Ranked single-system POTA data blocks (one block per target zone for each target unit. Each block has NSEN records-one per system)

Table 3-2. Run Specification Record (on Logical Unit 12)

TADER name	Column	Entry	Format
TD1	1-2	Alphanumeric portion of run ID	A2
ID1	3-5	Integer portion of run ID	I3
NSEN	6-8	Number of sensor systems in scenario	I3

Table 3-3. Ranked Single-system POTA Data Block (on Logical Unit 12) (for a specific unit IU in a target zone K)

TADER name	Column	Entry	Format
IU	1-5	Numeric index of target unit	I5
UID(IU)	6-8	Alphabetic unit ID	A3
NF	9-13	Numeric index of the system with the NIth largest single-system POTA (vs unit IU in zone K) where NI is the index of the record within a zone block.	I5
SID(NF)	14-16	Alphabetic system ID for system NF.	A3
K	17-21	Target zone for this zone block	I5
POTAT(K,NI)	22-29	Single-system POTA for system NF scanning unit IU in target zone K.	F8.3
1.-PRODT	30-37	Unit POTA for unit IU in zone K from the cumulative independent effect of the NI largest single-system POTAs.	F8.3
PUT(K,JK,NF) JK=1, IELT	38-77	The single-system POTA value for system NF vs all elements of type JK in unit IU in target zone K, based on the "OR" lucrativeness criteria being applied.	5F8.3
PUT1(K,JK,NF) JK=2, 3	78-93	The single-system POTA value for system NF vs all elements of type JK in unit IU in target zone K, based on the "AND" lucrativeness criterion being applied.	2F8.3

```
Ux800  2
  1 1A    2 B.    1    .808    808    000    323   .085   .000   .183    924    796
  1 1A    1 A.    1    .147   .836   .000   .039   .018   .000    000    191    168
  1 1A    2 B.    2    .747   .747   .000    284   .061   .000    119    912    748
  1 1A    1 A.    2    .181   .793   .000    047   .006   .000    000   .400    232
  1 1A    2 B.    3    .575   .575   .000   .206   .026   .000   .000    880    622
  1 1A    1 A.    3    .000   .575   .000   .000   .000   .000   .000   .000    000
  1 1A    2 B.    4    .110   .110   .000    038   .001   .000   .000    481    143
  1 1A    1 A.    4    .000   .110   .000   .000   .000    000   .000   .000    000
  1 1A    2 B.    5    .000   .000   .000   .000   .000   .000   .000    000   .000
  1 1A    1 A.    5    .000   .000   .000   .000   .000   .000   .000   .000   .000
```

Figure 3-6. Example Logical Unit 12 Output

(1) Let NSEN = number of sensor systems in the scenario. A ranked single-system POTA data block will have NSEN records for each unit/target zone combination. The nth record in a block will contain data on the nth largest single-system POTA (vs that unit).

(2) The run ID, unit ID, and system ID echo TADER input data.

(3) The index for a system or a target unit is the position in the TADER input data.

b. Logical Unit 14. Logical unit 14 is intended only for use as input to the Sort/Count Postprocessor. The structure of the TADER output on logical unit 14 is shown in Table 3-4. The file organization, description, and format are shown in Tables 3-5 and 3-6. An example of output is described in Figure 3-7. Elaborating remarks include:

(1) The numeric ID for system and unit is based on order of input in TADER input data. The alphabetic ID echoes TADER input data.

(2) Data is first grouped by target unit. Data for a given unit is ordered by system number.

Table 3-4. Structure of TADER Output on Logical Unit 14

Run specification block (one record) System data blocks (one block per unit and system/(IELT+1 records per block)) • Element POTA data set (one block per element type/(IELT records per block)) • Unit POTA data set (one record)

Table 3-5. Run Specification Block (on Logical Unit 14)

TADER name	Column	Entry	Format
TD1	1-2	Alphanumeric portion of run ID	A2
ID1	3-5	Integer portion of run ID	I3
NSEN	6-8	Number of sensor systems in data	I3

Table 3-6. System Data Block for Unit IU and System NI (on Logical Unit 14)

TADER name	Column	Entry	Format
Element POTA Data Set Format (one record per element type)			
NI	1-10	Numeric ID of system	I10
SID(NI)	11-13	Alphabetic ID of system	A3
IU	14-18	Numeric ID of target unit	I5
UID(IU)	19-21	Alphabetic ID of target unit	A3
JK	22-24	Element type	I3
PUT(K,JK,NI) K=1, 10	25-104	The single-system POTA value for system NI vs all elements of type JK in unit IU in target zone K, based on the "OR" lucrativeness criterion being applied.	10F8.6
Unit POTA Data Set Format (one record)			
NI	1-10	Numeric ID of system	I10
SID(NI)	11-13	Alphabetic ID of system	A3
IU	14-18	Numeric ID of target unit	I5
UID(IU)	19-21	Alphabetic ID of target unit	A3
PUL(K,NI) K=1, 10	25-104	The single-system POTA value for system NI vs unit IU in target zone K.	10F8.6

```
UX800  2
     1 A.     1 1A  1 .000000 .000000 .000000 .000000 .000000
     1 A.     1 1A  2 .039463 .046524 .000000 .000000 .000000
     1 A.     1 1A  3 .017989 .005693 .000000 .000000 .000000
     1 A.     1 1A  4 .000000 .000000 .000000 .000000 .000000
     1 A.     1 1A  5 .000000 .000000 .000000 .000000 .000000
     1 A.     1 1A  6 .146943 .181476 .000000 .000000 .000000
     2 B.     1 1A  1 .000000 .000000 .000000 .000000 .000000
     2 B.     1 1A  2 .323213 .283886 .205863 .038339 .000000
     2 B.     1 1A  3 .085423 .060931 .026329 .000626 .000000
     2 B.     1 1A  4 .000000 .000000 .000000 .000000 .000000
     2 B.     1 1A  5 .182988 .118865 .000000 .000000 .000000
     2 B.     1 1A  6 .807935 .746826 .574585 .109542 .000000
```

Figure 3-7. Example Logical Unit 14 Output

3-6. DOMINANT SYSTEM POSTPROCESSOR. The Dominant System Postprocessor is a postprocessor which reads user input and the TADER output on logical Unit 12. It then lists, for every target unit processed, the n most dominant (largest) single-system POTAs contributing to form the unit POTA, along with the cumulative effects and the "single-system POTA vs element type" components of the listed single-system POTAs. It is exactly the same information as provided by TADER basic single-system POTA print output (Figure 3-2), except that it is formatted differently. Table 3-7 describes required user input. Figure 3-8 shows example input, which, applied to the example case, produces the output shown in Figures 3-9 and 3-10. The input (Figure 3-8) is for US(DAY) against WP. It processes one target unit, named UNIT 1A, with five target zones. A rank ordered list of two systems will be produced. System 1 is a STANO radar (ICMB(1)=0) with name RADAR. System 2 is a standoff SLAR (ICMB(2)=3) with name ST SLAR. The output in Figure 3-9 shows the rank ordered list of single-system POTAs versus UNIT 1A, along with their cumulative effect. Figure 3-10 expands this list to include component single-system POTAs versus element type. Appendix C shows the FORTRAN source code for the Dominant System Postprocessor.

Table 3-7. User Input to Dominant System Postprocessor

TADER name	Column	Entry	Format
Record 1			
SENS	1-11	Label for sensor force	A11
TGT	12-15	Label for target force	A4
Record 2			
NUMU	1-5	Number of target units processed	I5
NZONE	6-10	Number of target zones	I5
NLIST	11-14	The number of dominant systems to by listed, i.e., the length of the list for each unit.	I4
Record set 3			
UNIT(N), N=1, NUMU		Alphabetic name for target unit	8A10
Record set 4			
L,ICMB(L), SNAME(L), L=1, NSEN		System number (based on order of input), system type (=ICMB(L)), descriptive name for system L.	4(I3, I2,A13)

```
US( DAY )  WP
   1    5   2
  UNIT 1A
 1 O(        RADAR)  2 3(     ST SLAR)
```

Figure 3-8. User Input to Dominant System Postprocessor

```
-- RUN ID=Ux800 --

                    ** US( DAY ) SENSOR SYSTEMS VS.  WP TARGET UNITS **

          TABLE OF DOMINANT SINGLE SYSTEM POTA 'S  VS. UNIT FOR EACH UNIT/ZONE COMBINATION

                              -- KEY TO SYSTEM ID'S --

  STANO RADAR      COUNTERBTRY RADAR  CBTRY   ACOUSTIC     STANDOFF SLAR    PENETRATING SYS
----------------- ----------------- ----------------- ----------------- -----------------
SYS               SYS               SYS               SYS               SYS
 1  (      RADAR)  0                 0                 2  (    ST SLAR)  0
```

UNIT ID	TGT ZONE 1 SYS ID	TGT ZONE 1 SYS POTA	TGT ZONE 1 CUM POTA	TGT ZONE 2 SYS ID	TGT ZONE 2 SYS POTA	TGT ZONE 2 CUM POTA	TGT ZONE 3 SYS ID	TGT ZONE 3 SYS POTA	TGT ZONE 3 CUM POTA	TGT ZONE 4 SYS ID	TGT ZONE 4 SYS POTA	TGT ZONE 4 CUM POTA	TGT ZONE 5 SYS ID	TGT ZONE 5 SYS POTA	TGT ZONE 5 CUM POTA
UNIT 1A	2	808	808	2	747	747	2	575	575	2	110	110	2	000	000
	1	147	836	1	181	793	1	000	575	1	000	110	1	000	000
	ALL		836	ALL		793	ALL		575	ALL		110	ALL		000

Figure 3-9. Example Summary of Dominant System POTAs

** UNIT 1A ** DOMINANT SINGLE SYSTEM POTA'S VS EACH ELT TYPE IN EACH UNIT/ZONE

TGT ZONE 1

		('OR' LUCRATIVE COND)					('AND' COND)	
SYS ID	SYS POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	ELT 2	ELT 3
2	.81	00	32	09	00	18	92	.80
1	15	.00	04	.02	.00	.00	19	17
0	00	.00	.00	.00	.00	.00	00	00
0	00	.00	00	.00	00	.00	00	00
0	.00	.00	.00	.00	.00	.00	00	.00

TGT ZONE 2

		('OR' LUCRATIVE COND)					('AND' COND)	
SYS ID	SYS POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	ELT 2	ELT 3
2	75	.00	38	06	00	12	91	75
1	18	00	05	01	00	00	40	23
0	00	00	00	00	00	00	00	00
0	00	.00	00	00	00	00	00	00
0	.00	00	.00	00	00	00	00	00

TGT ZONE 3

		('OR' LUCRATIVE COND)					('AND' COND)	
SYS ID	SYS POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	ELT 2	ELT 3
2	.57	.00	.31	.03	.00	.00	.88	.83
1	.00	.00	00	.00	.00	.00	.00	00
0	.00	.00	.00	.00	.00	.00	00	.00
0	.00	.00	.00	.00	.00	.00	00	.00
0	.00	.00	.00	.00	.00	.00	.00	.00

TGT ZONE 4

		('OR' LUCRATIVE COND)					('AND' COND)	
SYS ID	SYS POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	ELT 2	ELT 3
2	.11	.00	.04	.00	00	00	48	14
1	.00	.00	00	.00	00	00	00	00
0	.00	00	.00	.00	00	00	00	00
0	00	.00	.00	00	00	00	00	00
0	.00	00	00	00	00	00	00	00

TGT ZONE 5

		('OR' LUCRATIVE COND)					('AND' COND)	
SYS ID	SYS POTA	ELT 1	ELT 2	ELT 3	ELT 4	ELT 5	2	3
2	00	.00	00	00	.00	.00	.00	00
1	00	.00	00	.00	.00	00	00	00
0	00	.00	.00	00	.00	.00	.00	00
0	00	.00	.00	.00	.00	.00	00	00
0	00	00	00	.00	00	.00	00	00

Figure 3-10. Example List - Dominant System POTAs by Element Type

3-7. SORT/COUNT POSTPROCESSOR. The Sort/Count Postprocessor reads user input along with TADER output from logical unit 14. As explained in paragraph J-1, it then processes cases defined by specified upper and lower bounds of single-system POTAs. For each case, the postprocessor outputs one or both of:

a. A matrix showing the number of units with single-system POTAs between case bounds for each target zone and element type.

b. A matrix for each target zone/element type showing which system/unit combinations have single-system POTA values within case bounds.

The description and formats of the card image input to the Sort/Count Postprocessor are shown in Table 3-8.

Table 3-8. User Input to Sort/Count Postprocessor

TADER name	Column	Entry	Format
Record 1			
NUMU	1-5	Number of target units	I5
NSEN	6-10	Number of sensor systems	I5
NZONE	11-15	Number of target zones	I5
NCASE	16-20	Number of cases	I5
IELT	21-25	Number of element types	I5
IZ (K), K=1, N=ZONE	26-75	Number of units to be processed in target zone k	10I5
Record group 2			
(one set of records for each target zone, in order of zone)			
IUNIT(I,K) I=1, IZ(k)		Ordinal number (in TADER input) of I-th unit to be processed in target zone k (all nonprocessed units are ignored)	16I5
Record group 3			
(one record for each case N, in order of case)			
N	1-5	Case Number	I5
IFLAG(N)	6-10	If positive, only the matrix showing number of units with single-system POTA in case bounds is printed. If zero or negative, detail on which units have these POTAs is also printed.	I5
BU(N)	11-15	Lower bound for case N	I5
UU(N)	16-20	Upper bound for case N	I5

An example card image input to the sort/count postprocessor is shown in Figure 3-11. The example set shows one target unit, two sensor systems, five target zones, one case to process, five element types, and one unit to be processed in each target zone. Unit 1 (first unit of TADER case) is to be processed in each zone. In case 1, both types of matrix output are to be printed. The lower POTA bound for case 1 is 0.10. The upper POTA bound is 1.0. This input data is applied to the example case to produce the postprocessor outputs of the type shown in Figure 3-12 and Figure 3-13. Figure 3-12 shows a matrix of the type described in 3-7a above. The entries show the number of single-system POTAs, over all units processed, which lie within case 1 bounds (0.10 and 1.0) for each system versus either a full target unit or the specified element type in the specified target zone. Thus, system 1 had one unit POTA within bounds in both zones 1 and 2, while system 2 had one unit POTA in bounds in zones 1 through 4. System 2 also had one element type POTA within bounds for element type 2 in zones 1 through 3. Figure 3-13 shows a matrix of the type described in 3-7b above. It expands the information in Figure 3-12 by printing a matrix for every column in Figure 3-12 which shows which units had the in-bound system POTAs. Only the five matrices against element types in zone 1 are shown in Figure 3-13. The column headings are SYS for system number, TOT for total over all units (same as the entry in Figure 3-13 for that element type and zone), followed by the ordinal numbers of all units processed. (The example shows only one unit, 1). An X in the system/unit number entry indicates a single-system POTA versus the specified (in heading of matrix) element type. A blank entry indicates that the associated system POTA is not in the case bounds.

```
1    2    5    1    5    1    1    1    1    1
1
1
1
1
1
1   -1  .10  1.0
```

Figure 3-11. Example User Input to Sort/Count Postprocessor

```
******* CASE= 1 *******      *** RUN ID=UX800 ***

** SUMMARY-NUMBER OF SINGLE SYSTEM POTAS BETWEEN .100 AND1.000  FOR UNITS NORMALLY IN ZONE  ***
          UNIT          ELT 1          ELT 2          ELT 3          ELT 4          ELT 5
         -ZONE-         -ZONE-         -ZONE-         -ZONE-         -ZONE-         -ZONE-

SYS    1 2 3 4 5      1 2 3 4 5      1 2 3 4 5      1 2 3 4 5      1 2 3 4 5      1 2 3 4 5

 1     1 1 0 0 0      0 0 0 0 0      0 0 0 0 0      0 0 0 0 0      0 0 0 0 0      0 0 0 0 0
 2     1 1 1 1 0      0 0 0 0 0      1 1 1 0 0      0 0 0 0 0      0 0 0 0 0      1 1 0 0 0
```

Figure 3-12. Example Sort/Count Processor Summary Output

```
   *** ZONE= 1      ELT= 1 ***
  *** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN  .10   AND 1.00  ***

SYS  TOT  1

 1    0
 2    0

   *** ZONE= 1      ELT= 2 ***
  *** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN  .10   AND 1.00  ***

SYS  TOT  1

 1    0
 2    1   X

   *** ZONE= 1      ELT= 3 ***
  *** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN  .10   AND 1.00  ***

SYS  TOT  1

 1    0
 2    0

   *** ZONE= 1      ELT= 4 ***
  *** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN  .10   AND 1.00  ***

SYS  TOT  1

 1    0
 2    0

   *** ZONE= 1      ELT= 5 ***
  *** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN  .10   AND 1.00  ***

SYS  TOT  1

 1    0
 2    1   X
```

Figure 3-13. Example Sort/Count Processor Detail Output

APPENDIX A

TADER (TAS III) PROGRAM SOURCE CODE

MAIN PROGRAM	pages A-3 through A-22
SUBROUTINE COVER	pages A-23 through A-36
FUNCTION BSUM	pages A-37 through A-40

(NOT USED)

MAIN PROGRAM

```
C     THIS ROUTINE, DENOTED AS MAIN PROGRAM TAS III, CALCULATES THE COMBINED
C     PROBABILITY OF OPERATIONAL TARGET ACQUISITION (POTA) VALUES FOR
C     A FORCE OF NONSIGINT SENSORS SCANNING A SET OF NOTIONAL TARGET UNITS.
C     THE PROGRAM INPUTS CHARCTERISTICS AND LOCATIONS (DEPLOYMENTS) OF SENSOR
C     SYSTEMS AS WELL AS TOE'S OF TARGET UNITS. IN ADDITION, A LUCRATIVENESS
C     THRESHOLD IS INPUT FOR EACH ELEMENT TYPE IN EACH TARGET UNIT. EACH
C     THRESHOLD IS EXPRESSED AS A FRACTION OF THE TOE (OF A UNUT TYPE).
C     PROGRAM TAS III THEN COMPUTES A SYSTEM POTA FOR EACH COMBINATION
C     OF SENSOR SYSTEM AND TARGET TYPE.  THE SYSTEM POTA FOR A SYSTEM IS THE
C     PROBABILITY THAT THE SPECIFIED SYSTEM DETECTS,AND CLASSIFIES AS LUCRATIVE
C     THE SPECIFIED TARGET UNIT TYPE. FOR EACH TARGET UNIT TYPE, THE ASSOCIATED
C     SYSTEM POTA'S ARE COMBINED INTO AN OVERALL POTA CHARACTERIZING ALL
C     DEPLOYED SYSTEMS. THE OVERALL POTA IS TABULATED FOR EACH TARGET UNIT AND
C     IS DEFINED AS THE PROBABILITY THAT AT LEAST ONE SENSOR SYSTEM DETECTS,
C     AND CLASSIFIES AS LUCRATIVE, A SPECIFIED TARGET UNIT. POTA'S ARE COMPUTED
C     FOR THE TARGET UNIT RANDOMLY LOCATED IN SPECIFIED DISTANCE(FROM FEBA)
C     STRIPS (CALLED TARGET ZONES ).
C
C   ARGUMENTS : NOT APPLICABLE
C
C   CALLED BY : NOT APPLICABLE
C
C   CALLS
C       - SUBROUTINE COVER
C
C   FILES USED : INPUT - UNIT 5
C
C               OUTPUT - PRINT
C               OUTPUT - UNIT 12(ORDERED SINGLE SYSTEM POTA'S (FOR INPUT
C                                TO THE 'DOMINANT SYSTEM POSTPROCESSOR')
C
C               OUTPUT - UNIT 14(BASIC SINGLE SYSTEM POTA'S (FOR INPUT
C                                TO THE ' SORT / COUNT POSTPROCESSOR ')
C
C                       ** VARIABLE DICTIONARY **
C
C  *** SIGNIFICANT LOCAL VARIABLES ***
C
C  NAME              DIMENSION                 DESCRIPTION
C
C  ID1               1             THE NUMERIC PART OF THE RUN ID,AS INPUT.
C
C  IU                1             INDEX OF UNIT TYPE BEING PROCESSED
C
C  INDS(K,I)         (10,30)       WORKING ARRAY CONTAINING THE SYSTEM NUMBER
C                                  ID OF THE I-TH LARGEST SINGLE SYSTEM POTA
C                                  (VS. THE UNIT BEING PROCESSED) IN
C                                  TARGET ZONE K.
C
C  IOMIT(IU)         50            FLAG CONTROLLING PROCESSING OF
```

```
C                                        EACH UNIT. IF IOMIT(IU) .LT. 0,THEN
C                                        UNIT IU WILL NOT BE PROCESSED.
C
C  IP                  1                 INDEX OF SENSOR SYSTEM TYPE BEING PROCESSED
C
C  ITHRA(J-3,K,IU)     (2,10,50)         SAME AS ITRPB(J) WHEN ISAL(J,K)=0. ELSE
C                                        THIS =0.(ONLY APPLIES WHEN J=4 OR 5)
C
C  IU1                 1                 DURING BINOMIAL CALCULATIONS OF A SCAN OF
C                                        ELTS IN A UNIT,A NORMAL APPROXIMATION TO
C                                        THE BINOMIAL IS USED IF THE NR OF ELTS
C                                        IN THE UNIT (OF THE TYPE BEING PROCESSED)
C                                        EXCEEDS IU1. OTHERWISE THE ACTUAL BINOMIAL
C                                        IS  USED.
C
C  IZERO(IU,J)         (50,5)            FLAG (0=NOT PRESENT, .GT.0= PRESENT),
C                                        USED ONLY FOR ELT TYPES 4 & 5, TO
C                                        INDICATE THE PRESENCE OF AT LEAST 1 ELT
C                                        IN AT LEAST 1 TARGET ZONE.
C
C  LTHR                1                 FLAG (.LE.0=DON'T, .GT.0=DO) CONTROLLING
C                                        PRINTING OF LUCRATIVENESS THRESHOLDS
C                                        (IN TERMS OF NR ELTS) FOR EACH ELT TYPE
C                                        IN EACH UNIT.
C
C  LUNIT               1                 FLAG (.LE.0=DON'T, .GT.0=DO),CONTROLLING
C                                        PRINTING OF THE TWO (NOT ORDERED &
C                                        ORDERED) SINGLE SYSTEM POTA TABLES.
C
C  NOWRIT              1                 FLAG (.LE.0 = DON'T, .GT.0 = DO ) FOR
C                                        RESULTS TO BE WRITTEN ONTO LOGICAL
C                                        UNITS 12 & 14 FOR USE BY THE SORT/COUNT
C                                        POSTPROCESSOR AND THE DOMINANT SYSTEM
C                                        POSTPROCESSOR.
C
C  NUMU                1                 NUMBER OF UNIT TYPES PROCESSED
C
C  NZFLAG              1                 (INPUT) FLAG CONTROLLING PROCESSING OF
C                                        INHERENT SENSOR DETECTION DATA (PDET).
C                                        NZFLAG=0 MEANS THAT INHERENT SENSOR
C                                        DETECTION DATA FOR A TARGET IS BASED ON
C                                        THE SENSOR ZONE CONTAINING THE TARGET.
C                                        NZFLAG=1 MEANS THAT INHERENT SENSOR
C                                        DETECTION DATA FOR A TARGET IS BASED ON
C                                        THE TARGET ZONE CONTAINING THE TARGET.
C
C  PCD(IP)             30                THE SCALE FRACTION APPLIED TO THE INPUT
C                                        VALUES OF INHERENT PROBABILITIES OF
C                                        DETECTION FOR SYSTEM I.
C
```

```
C  PCPF(I)               (30)          PROBABILITY OF SUCCESSFUL (NONDEGRADED) CREW
C                                      PERFORMANCE FOR SYSTEM I.
C
C  POTAT(K,I)            (10,30)       WORKING ARRAY CONTAINING THE VALUE
C                                      OF THE I-TH LARGEST SINGLE SYSTEM POTA
C                                      (VS. THE UNIT BEING PROCESSED) IN
C                                      TARGET ZONE K.
C
C  PSMO(I)               (30)          PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                      FROM SMOKE.
C
C  PWEA(I)               30            PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                      FROM WEATHER EFFECTS.
C
C  PWIND(I)              30            PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                      FROM WIND EFFECTS.
C
C  SRANGE                1             MAXIMUM DETECTION RANGE (KM) OF THE
C                                      STANDOFF SLAR SENSOR BEING PROCESSED.
C
C  TADD                  1             (INPUT) INCREMENTAL OFFSET WHICH,WHEN ADDED
C                                      TO TPCT(J) YIELDS THE ("OR" CONDITION)
C                                      LUCRATIVENESS FRACTION FOR THE UNIT AND
C                                      TARGET ZONE BEING PROCESSED.
C
C  TD1                   1             THE CHARACTER PART OF THE  RUN ID
C
C  XXT(J,IU)             (5,50)        SAME AS THE INPUT TPCT(J) ASSOCIATED WITH
C                                      UNIT IU.
C
C  XXT1(J,IU)            (5,50)        SAME AS THE INPUT TPCT1(J) ASSOCIATED WITH
C                                      UNIT IU.
C
C  ZDS(KS)               10            DISTANCE (KM),FROM THE EMPLACED SENSOR,OF
C                                      THE UPPER (FURTHEST) BOUNDARY OF SENSOR
C                                      ZONE KS.
C
C  ZLAB(K)               10            LABELS FOR TARGET ZONES.
C
C  ZELAB(K)              10            LABELS FOR TARGET ZONES.
C
C  *** COMMON(UNLABELED) VARIABLES ***
C
C  FA(I)                 30            PROBABILITY  (FRACTION TIME) THAT A SENSOR
C                                      OF SYSTEM TYPE I IS AVAILABLE (SENSING).
C
C  FACT(IA,IE,J,K,IU) (2,2,5,10,50) FRACTION OF ELEMENTS OF ELT TYPE J IN
C                                      UNIT IU & TARGET ZONE K WHICH ARE IN
C                                      ACTIVITY STATE IA AND ENVIRONMENT
C                                      STATE IE . THESE ARE :
```

```
C
C                                           ACTIVITY STATE 1-MOVING
C                                           ACTIVITY STATE 2-NOT MOVING
C                                           ENVIRONMENT STATE 1-IN OPEN TERRAIN
C                                           ENVIRONMENT STATE 2-IN WOODS/TOWNS
C
C                                           THESE COMPRISE ALL ELEMENT ACTIVITY
C                                           AND ENVIRONMENT STATES. HENCE, FOR
C                                           FIXED J,K,IU, THE FACT(IA,IE,,,) MUST
C                                           SUM TO 1.00 OVER THE 4 ACTIVITY /
C                                           ENVIRONMENT COMBINATIONS.
C
C  FC(J,K,I,IA,IE)    (5,10,30,2,2) FRACTION OF INHERENT DETECTION CAPABILITY
C                                           APPLICABLE TO A SINGLE SENSOR OF TYPE I
C                                           SCANNING A SINGLE ELEMENT OF TYPE J IN
C                                           SENSOR ZONE K AND IN ACTIVITY IA AND
C                                           ENVIRONMENT IE. I.E. THIS IS A MULTIPLIER
C                                           OF PDET(J,K,I) WHICH ADJUSTS THE PROBABILITY
C                                           OF DETECTION UNDER IDEAL CONDITIONS TO ONE
C                                           UNDER ACTIVITY A AND ENVIRONMENT E.
C
C  FS(I)              30                    PROBABILITY THAT A SENSOR OF SYSTEM TYPE I
C                                           IS NOT DESTROYED.
C
C  HPEN(N,I)          (110,30)              USED ONLY FOR I WITH ICMB(I)=4(RPV,PATROL..)
C                                           OR WITH ICMB(I)=2 (CBTRY ACOUSTIC).
C                                           THE HORIZONTAL (PARALLEL TO FEBA) DIMENSION
C                                           OF THE N-TH COVERAGE RECTANGLE OF THE
C                                           THE MISSIONS OF SYSTEM I.
C
C  IAVG(K)            10                    INPUT PARAMETER REGULATING PROCESSING
C                                           OF STRIPS. DURING PROCESSING,ONLY EVERY
C                                           N-TH STRIP OF UNIT DEPTH IS PROCESSED,
C                                           WHERE N=IAVG(K).
C
C  ICMB(I)            30                    THE TYPE OF SENSOR SYSTEM CHARACTERIZING
C                                           SYSTEM I:
C                                           ICMB=0 FOR STANO RADAR& STATIONARY GND OBSV
C                                           ICMB=1 FOR COUNTERBTRY/COUNTERMORTAR RADAR
C                                           ICMB=2 FOR COUNTERBTRY ACOUSTIC
C                                           ICMB=3 FOR STANDOFF AIR RADAR(SLAR)
C                                           ICMB=4 FOR RPV,PATROL,PENETRATING ABN RADAR
C
C  IELT               1                     NUMBER OF ELEMENT TYPES PROCESSED
C
C  IQET(J,K,IU)       (5,10,50)             NUMBER OF TO&E ELEMENTS OF TYPE J IN UNIT I
C                                           WHEN IN TARGET ZONE K.
C
C  IRPS(J)            5                     NUMBER OF ROUNDS FIRED PER VOLLEY BY
C                                           ARTY/MISSILE/RKT ELTS OF TYPE J IN
```

```
C                                       THE UNIT BEING PROCESSED (ONLY APPLICABLE
C                                       TO ELT TYPES 4 & 5)
C
C  ISAL(J,K)         (5,10)             NUMBER OF ARTY/RKT/MISSILE VOLLEYS FIRED
C                                       IN THE UNIT BEING PROCESSED IN TGT
C                                       ZONE K BY THE CLUSTER OF ELTS OF TYPE J.
C                                       (ONLY APPLICABLE TO ELT TYPES 4 & 5)
C
C  ISWD              1                  SECTOR(FEBA) WIDTH(KM)
C
C  ISZONE(L)         400                THE SENSOR ZONE(SUBSCRIPT OF ZDS)ASSOCIATED
C                                       WITH A POINT L KM FROM THE SENSOR.
C
C  ITRPB(J)          5                  THE LUCRATIVENESS THRESHOLD FOR VOLLEYS
C                                       FIRED FROM  ALL ARTY/MISSILE/RKT ELTS OF
C                                       TYPE J (J=4,5) IN ALL TARGET ZONES FOR
C                                       UNIT IU. IT IS THE MINIMUM NIMBER OF
C                                       VOLLEYS (FROM ALL LAUNCHERS) THAT MUST
C                                       BE DETECTED DURING THE SEARCH PERIOD
C                                       TO DETERMINE A LUCRATIVE DETECTION.
C
C  ITZONE(L)         300                THE TARGET ZONE (SUBSCRIPT OF ZD)ASSOCIATED
C                                       WITH A POINT L KM TO THE REAR OF THE FEBA.
C
C  NPIECE(I)         30                 FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR
C                                       & FOR ICMB(I)=2(COUNTERBATTERY ACOUSTIC)
C                                       THIS IS THE NUMBER OF COVERAGE RECTANGLES
C                                       IN THE MISSIONS OF SYSTEM TYPE I.
C                                       CURRENTLY THE VALUE OF NPIECE(I) SHOULD BE
C                                       .LE. 110 FOR EACH I.
C
C                                       FOR ICMB(I)=0,1, OR 3,THIS VALUE IS IGNORED
C
C  NSEN                                 NUMBER OF (SENSOR) SYSTEMS
C
C  NSYS(I)           30                FOR ICMB(I)=0,1(STATIONARY RADAR/OBSERVER)
C                                       THIS IS THE NUMBER OF EMPLACED SENSORS OF
C                                       SYSTEM TYPE I.
C
C                                       FOR ICMB(I)=3(STANDOFF SLAR) THIS IS THE
C                                       NUMBER OF MISSIONS OF SYSTEM TYPE I.
C
C                                       FOR ICMB(I)=1,2, OR 4, THIS VALUE IS
C                                       IGNORED.
C
C  NSZONE            1                  NUMBER OF SENSOR SURVEILLANCE ZONES.
C                                       THESE ARE BASED ON DISTANCE FROM EMPLACED
C                                       SENSOR.
C
C  NZFLAG            1                  FLAG CONTROLLING PROCESSING OF INHERENT
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C                                    SENSOR DETECTION DATA(PDET),VIZ:
C
C                                    NZFLAG=0 MEANS THAT INHERENT SENSOR
C                                    DETECTION DATA FOR A TGT IS PROCESSED
C                                    BASED ON THE SENSOR ZONE THE TGT IS IN.
C
C                                    NZFLAG=1 MEANS THAT INHERENT SENSOR
C                                    DETECTION DATA FOR A TGT IS PROCESSED
C                                    BASED ON THE TARGET ZONE IN WHICH THE
C                                    TARGET IS LOCATED.
C
C  NZONE           1                 NUMBER OF TARGET ZONES.
C                                    THESE ARE BASED ON DISTANCE FROM FEBA.
C
C  PDEG(K,I)       (10,30)           THE PRODUCT OF THE WEATHER,WIND,SMOKE,
C                                    CREW PERFORMANCE,VISIBILITY AND SCALE
C                                    NONDEGRADATION FACTORS FOR SYSTEM I
C                                    SCANNING IN TARGET ZONE K.
C
C  PDET(J,K,I)     (5,10,30)         INHERENT PROBABILITY OF DETECTION=
C                                    PROBABILITY THAT A SINGLE SENSOR OF
C                                    SYSTEM I WILL DETECT A SINGLE ELEMENT OF
C                                    TYPE J IN AN IDEAL ENVIRONMENT IN SENSOR
C                                    ZONE K
C
C  PFIR(J,K)       (5,10)            THE FRACTION OF UNITS (OF THE UNIT TYPE
C                                    BEING PROCESSED) WHICH ARE FIRING
C                                    ARTY/MISSILES/RKTS FROM ELT TYPE J IN
C                                    IN  TARGET ZONE K.
C
C  POTA(K,IU)      (10,50)           POTA VALUE FOR UNIT IU IN TARGET ZONE K
C                                    THIS IS THE PROBABILITY THAT AT LEAST 1
C                                    SENSOR OF AT LEAST ONE SYSTEM DETECTS AND
C                                    CLASSIFIES UNIT IU IN TARGET ZONE K AS A
C                                    LUCRATIVE TARGET.
C
C  PUL(K,I)        (10,30)           THE SINGLE SYSTEM POTA FOR EACH SYSTEM I
C                                    .VS.  THE UNIT BEING PROCESSED IN TARGET
C                                    ZONE K. THIS IS THE PROBABILITY THAT
C                                    AT LEAST 1 SENSOR OF SYSTEM TYPE I
C                                    DETECTS AND CLASSIFIES AS LUCRATIVE,
C                                    WITH RESP TO AT LEAST 1 ELT TYPE, THE UNIT
C                                    IN TARGET ZONE K BEING PROCESSED.
C
C  PUT(K,J,I)      (10,5,30)         THE SINGLE SYSTEM POTA VALUE FOR EACH
C                                    SYSTEM I .VS. ALL ELEMENTS OF TYPE J IN
C                                    THE UNIT BEING PROCESSED IN TARGET
C                                    ZONE K, BASED ON THE "OR" LUCRATIVENESS
C                                    CRITERION BEING APPLIED IN TARGET
C                                    ZONE K. THIS IS THE PROBABILITY THAT
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C                                       AT LEAST 1 SENSOR OF SYSTEM TYPE I
C                                       DETECTS AND CLASSIFIES AS LUCRATIVE,
C                                       WITH RESPECT TO ELT TYPE J,THE UNIT
C                                       IN TARGET ZONE K BEING PROCESSED.
C
C  PUT1(K,J,I)         (10,5,30)        THE SINGLE SYSTEM POTA VALUE FOR EACH
C                                       SYSTEM I .VS. ALL ELEMENTS OF TYPE J IN
C                                       THE UNIT BEING PROCESSED IN TARGET ZONE
C                                       K, BASED ON THE "AND" LUCRATIVENESS
C                                       CRITERION BEING APPLIED IN TARGET
C                                       ZONE K.
C
C  PVIS(L,I)           (10,30)          PROBABILITY OF AN UNOBSTRUCTED LINE-OF-
C                                       SIGHT FROM A SENSOR OF SYSTEM I TO A TARGET
C                                       ELEMENT IN SENSOR ZONE L.
C
C  RNGE(I,J)           (30,5)           MAXIMUM RANGE OF SYSTEM I VS. A SINGLE
C                                       ELEMENT OF TYPE J.
C
C  RT(N,I)             (110,30)         USED ONLY WHEN ICMB(I)=0,1,2  OR 4.
C                                       FOR ICMB(I)=0,1(STATIONARY RADARS,OBSERVERS)
C                                       THIS IS THE HORIZONTAL(X-) COORDINATE OF
C                                       THE N-TH EMPLACED SENSOR OF SYSTEM TYPE I.
C                                       FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR)
C                                       OR FOR ICMB(I)=2(COUNTERTBATTERY ACOUSTIC)
C                                       THIS IS THE HORIZONTAL(X-)COORDINATE OF THE
C                                       N-TH COVERAGE RECTANGLE FOR MISSIONS OF
C                                       SYSTEM I.
C                                       (COORDINATES ARE RELATIVE TO ORIGIN AT
C                                       LOWER LEFT CORNER OF SECTOR)
C
C  SID(I)              30               THE (INPUT) ALPHABETIC ID FOR SENSOR SYSTEM
C                                       I.
C
C  STB(I)              30               USED ONLY WHEN ICMB(I)=3(SLAR) OR WHEN
C                                       ICMB(I)=0 OR 1(STANO,CBTRY RADARS).
C
C                                       WHEN ICMB(I)=3(SLAR) THIS IS THE
C                                       STANDOFF(KM) OF THE SLAR PATH RELATIVE TO
C                                       THE FEBA. (THE SLAR PATH IS ASSUMED
C                                       PARALLEL TO FEBA AND WITH LENGTH=SECTOR
C                                       WIDTH).
C
C                                       WHEN ICMB(I)=0 OR 1 AND STB(I) .LT. 1000
C                                       THIS IS THE STANDOFF OF ALL SENSORS OF TYPE
C                                       I UNDER THE ASSUMPTION THAT THEY ARE
C                                       EMPLACED ON A LINE PARALLEL TO THE FEBA.
C                                       THE PROGRAM THEN GENERATES THE SENSOR
C                                       LOCATIONS. IF ICMB(I) .EQ. 0 OR 1 AND
C                                       STB(I) .GE. 1000 THEN THE LOCATIONS OF THE
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C                                        SENSORS ARE READ FROM USER INPUT.
C
C  THEA(I)            30                 USED ONLY WHEN ICMB(I)=0 OR 1. THIS IS
C                                        THE SCAN ANGLE,IN RADIANS,OF SYSTEM
C                                        TYPE N.
C
C  TPCT(J)            5                  (TPCT(J)+TADD) IS THE "OR" LUCRATIVENESS
C                                        FRACTION WHICH,WHEN MULTIPLIED BY UNIT
C                                        TO&E(IQET(J,K,IU)),YIELDS THE LUCRATIVENESS
C                                        THRESHOLD APPLIED SEPARATELY UNDER
C                                        "OR" CONDITIONS TO EACH ELEMENT TYPE
C                                        J IN TARGET ZONE K IN UNIT TYPE IU.
C
C  TPCT1(J)           5                  TPCT1 IS THE "AND" LUCRATIVENESS FRACTION
C                                        FRACTION, ONLY APPLIED TO ELT TYPES 2 & 3
C                                        (VEHICLES) WHICH,WHEN MULTIPLIED BY UNIT
C                                        TO&E(IQET(J,K,IU)),YIELDS THE LUCRATIVENESS
C                                        THRESHOLD APPLIED JOINTLY UNDER
C                                        "AND" CONDITIONS TO BOTH ELEMENT TYPES
C                                        J=2,3 IN TARGET ZONE K IN UNIT TYPE IU.
C
C  TPOS(IP,K,IU)      (4,10,50)          FRACTION OF PERSONNEL IN UNIT IU AND
C                                        TARGET ZONE K WHO ARE IN POSTURE IP
C                                        POSTURES ARE:
C                                         1=STANDING
C                                         2=PRONE
C                                         3=VEHICLE MOUNTED
C                                         4=FOXHOLE
C
C  UID(IU)            50                 THE (INPUT) ALPHABETIC ID FOR UNIT IU.
C
C  UPEN(N,I)          (110,30)           USED ONLY WHEN ICMB(I)=4(RPV,PATROL)
C                                        OR WHEN ICMB(I)=2 (COUNTERBATTERY ACOUSTIC).
C                                        THE VERTICAL(PERPENDICULAR TO FEBA)
C                                        DIMENSION OF THE N-TH COVERAGE RECTANGLE
C                                        OF THE MISSIONS OF SYSTEM I.
C
C  VPEN(N,I)          (110,30)           USED ONLY WHEN ICMB(I)=0,1,2  OR 4.
C                                        FOR ICMB(I)=0,1(STATIONARY RADARS,OBSERVERS)
C                                        THIS IS THE VERTICAL (Y-) COORDINATE OF
C                                        THE N-TH EMPLACED SENSOR OF SYSTEM TYPE I.
C                                        FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR)
C                                        OR FOR ICMB(I)=2(COUNTERBATTERY ACOUSTIC)
C                                        THIS IS THE VERTICAL (Y-)COORDINATE OF THE
C                                        N-TH COVERAGE RECTANGLE FOR MISSIONS OF
C                                        SYSTEM I.
C                                        (COORDINATES ARE RELATIVE TO ORIGIN AT
C                                        LOWER LEFT CORNER OF SECTOR)
C
C  XAVG(K)            10                 RESOLUTION(KM) OF THE COVERAGE GRID USED
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C                                   IN TARGET ZONE K DURING COVERAGE
C                                   CALCULATIONS FOR SYSTEM I. THIS IS THE
C                                   SIDE LENGTH OF EACH GRID SQUARE OF TARGET
C                                   ZONE K SCANNED IN SUBROUTINE COVER.
C
C  ZD(K)              10            DISTANCE(KM)FROM FEBA OF THE UPPER(REARMOST)
C                                   BOUNDARY OF TARGET ZONE K.
C
C  ZDS(KS)            10            DISTANCE(KM),FROM THE EMPLACED SENSOR,OF
C                                   THE UPPER(FURTHEST) BOUNDARY OF SENSOR
C                                   ZONE KS.
C
      DIMENSION
     +    INDS(10,30),       IOMIT(50),           ITHRA(2,10,50),
     +    IZERO(50,5),       PCD(30),             PCPF(30),
     +    POTAT(10,30),      PSMO(30),            PWEA(30),
     +    PWIND(30),         SID(30),             UID(50),
     +    XXT(5,50),         XXT1(5,50),          ZDS(10)
      COMMON
     +    FA(30),            FACT(2,2,5,10,50),   FC(5,10,30,2,2),
     +    FS(30),            HPEN(110,30),        IAVG(10),
     +    ICMB(30),          IELT,                IQET(5,10,50),
     +    IRPS(5),           ISAL(5,10),          ISWD,
     +    ISZONE(400),       ITRPB(5),            ITZONE(300),
     +    NPIECE(30),        NSEN,                NSYS(30),
     +    NSZONE,            NZFLAG,              NZONE,
     +    PDEG(10,30),       PDET(5,10,30),       PFIR(5,10),
     +    POTA(10,50),       PUL(10,30),          PUT(10,5,30),
     +    PUT1(10,5,30),     PVIS(10,30),         RNGE(30,5),
     +    RT(110,30),        STB(30),             THEA(30),
     +    TPCT(5),           TPCT1(5),            TPOS(4,10,50),
     +    UPEN(110,30),      VPEN(110,30),        XAVG(10),
     +    ZD(10)
      CHARACTER*2
     +    TD1
      CHARACTER*3
     +    SID,               UID
      CHARACTER*8
     +    ZLAB(10)
      CHARACTER*16
     +    ZELAB(10)
      ZLAB(1)='  ZONE 1'
      ZLAB(2)='  ZONE 2'
      ZLAB(3)='  ZONE 3'
      ZLAB(4)='  ZONE 4'
      ZLAB(5)='  ZONE 5'
      ZLAB(6)='  ZONE 6'
      ZLAB(7)='  ZONE 7'
      ZLAB(8)='  ZONE 8'
      ZLAB(9)='  ZONE 9'
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      ZLAB(10)=' ZONE 10'
      ZELAB(1)='ZONE 1 ELT TYPES'
      ZELAB(2)='ZONE 2 ELT TYPES'
      ZELAB(3)='ZONE 3 ELT TYPES'
      ZELAB(4)='ZONE 4 ELT TYPES'
      ZELAB(5)='ZONE 5 ELT TYPES'
      ZELAB(6)='ZONE 6 ELT TYPES'
      ZELAB(7)='ZONE 7 ELT TYPES'
      ZELAB(8)='ZONE 8 ELT TYPES'
      ZELAB(9)='ZONE 9 ELT TYPES'
      ZELAB(10)='ZONE 10 ELTTYPES'
C
C   READ THE RUN ID FOR THIS RUN,ALONG WITH THE LUCRATIVENESS FRACTION OFFSET
C   (ADDED TO LUCRATIVENESS FRACTION INPUT FOR EACH UNIT TOE) FOR THIS RUN.
C   READ FLAG = NR ELTS ABOVE WHICH NORMAL APPROX TO BINOMIAL IS DONE.
C   READ NR UNIT TYES,NR ELEMENT TYPES,NR (SENSOR) SYSTEM TYPES,NR TARGET
C   ZONES,PRINT FLAGS,NR SENSOR ZONES,AND SENSOR/TARGET ZONE PROCESSING FLAG
C
C   READ SCALING FRACTION FOR EACH SENSOR SYSTEM TYPE. THESE ARE APPLIED
C   TO THE INPUT SENSOR SYSTEM INHERENT PROBABILITIES OF DETECTION.
C   READ SECTOR WIDTH AND UPPER TARGET ZONE BOUNDARIES.
C   READ THE SAMPLING DENSITY FOR EACH TARGET ZONE I.(ONLY EVERY IAVG(I)-TH
C   STRIP IN TARGET ZONE I IS PROCESSED IN SUBROUTINE COVER)
C   READ THE SIZE (SIDE LENGTH) OF A GRID SQUARE PROCESSED IN EACH
C   TARGET ZONE.
C
      PRINT 4300
      READ (5,4400) TD1,ID1,TADD,IU1,NOWRIT
      READ (5,4500) NUMU,IELT,NSEN,NZONE,LUNIT,LTHR,NSZONE,NZFLAG
      IF (NOWRIT.GT.0)  THEN
        WRITE (12,4600) TD1,ID1,NSEN
        WRITE (14,4600) TD1,ID1,NSEN
      ENDIF
      READ (5,4700) (PCD(L),L=1,NSEN)
      READ (5,4800) ISWD,(ZD(I),I=1,10)
      READ (5,4900) (IAVG(I),I=1,10)
      READ (5,5000) (XAVG(I),I=1,10)
C
C   READ 'UPPER' SENSOR ZONE BOUNDARIES
C
      READ (5,5100) (ZDS(I),I=1,10)
      KP=60/(2+NZONE)
C
C   FOR LATER CALCULATIONS(IN SUBROUTINE COVER) THE TARGET ZONE
C   MUST BE KNOWN FOR EACH 'STRIP' PROCESSED  EACH 'STRIP' CORRESPONDS
C   TO AN INTEGER ON THE Y-AXIS(DISTANCES TO REAR OF FEBA)  THE TARGET
C   ZONE ASSOCIATED WITH EACH POINT ON THE Y-AXIS IS STORED IN ARRAY ITZONE.
C   IN ADDITION, THE SENSOR ZONE ASSOCIATED WITH EACH INTEGER DISTANCE FROM
C   AN EMPLACED SENSOR MUST BE KNOWN  THESE ARE STORED IN ARRAY ISZONE.
C
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      LSZONE=ZDS(NSZONE)
      DO 100 I=1,LSZONE
  100 ISZONE(I)=0.
      KPSS=65/(NSEN+2)
      JST=1
      KST=1
      LZONE=ZD(NZONE)
      DO 200 I=1,LZONE
  200 ITZONE(I)=0.
      DO 600 IY=1,LZONE
        ZZD=0.
        DO 300 IZ=KST,NZONE
          IF (IZ.GT.1) ZZD=ZD(IZ-1)
          IF (IY.LE.ZZD.OR.IY.GT.ZD(IZ)) GO TO 300
          ITZONE(IY)=IZ
          KST=IZ
          GO TO 400
  300   CONTINUE
  400   ZZD=0.
        DO 500 IZ=JST,NSZONE
          IF (IZ.GT.1) ZZD=ZDS(IZ-1)
          IF (IY.LE.ZZD.OR.IY.GT.ZDS(IZ)) GO TO 500
          ISZONE(IY)=IZ
          JST=IZ
          GO TO 600
  500   CONTINUE
  600 CONTINUE
C
C     THRU STMT 1600 READ SENSOR CHARACTERISTIC DATA FOR EACH (SENSOR)SYSTEM
C     TYPE N FOR N=1....NSEN.
C
      DO 1400 N=1,NSEN
        DO 700 M=1,96
          VPEN(M,N)=0.
          HPEN(M,N)=0.
          UPEN(M,N)=0.
  700   RT(M,N)=0.
C
C   READ PROB OF NO DEGRADATION BY WEATHER,SMOKE,CREW PERFORMANCE,AND WIND,
C   ALONG WITH NUMERIC CODE (ICMB(N)) FOR SENSOR SYSTEM TYPE AND SYSTEM ID.
C   READ PROB OF CLEAR LINE OF SIGHT(EXCLUDING SMOKE & WX) BY SENSOR ZONE.
C
        READ (5,5200) PWEA(N),PSMO(N),PCPF(N),ICMB(N),SID(N),PWIND(N)
        READ (5,5300) (PVIS(IZO,N),IZO=1,10)
C
C   READ NUMBER OF EMPLACED SENSORS(OR NR MISSIONS)-THIS IS DISREGARDED
C   WHEN ICMB(N)=[illegible](RPV) OR WHEM ICMB(N)=2 (COUNTERBATTERY ACOUSTIC).
C   ALSO READ STANDOFF DISTANCE OF STANDOFF SLAR (OR OF STANO/FO AND COUNTER-
C   BATTERY RADAR SYSTEMS WHEN THE PROGRAM GENERATES THEIR LOCATIONS),SCAN
C   ANGLE,NUMBER OF COVERAGE RECTANGLES ASSOCIATED WITH A PENETRATING SENSOR
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C    (RPV,PATROL,AIRBORNE RADAR),AND MAXIMUM RANGE OF STANDOFF SLAR SENSOR
C
          READ (5,5400) NSYS(N),STB(N),THEA(N),NPIECE(N),SRANGE
          M=NSYS(N)
C
C    TEST WHETHER THIS IS A RADAR/FO SYSTEM FOR WHICH THE PROGRAM
C    MUST GENERATE SENSOR LOCATIONS.
C
          IF (STB(N).LT.1000.AND.ICMB(N).LE.1)  THEN
C
C    FOR ICMB(N)=0 OR 1, GENERATE LOCATIONS OF ALL M EMPLACED SENSORS
C    SPACED AT UNIFORM INTERVALS ON A LINE AT STB(N) STANDOFF FROM
C    THE FEBA AND PARALLEL TO IT.
C
            DO 800 NN=1,M
              RT(NN,N)=FLOAT(ISWD*NN)/FLOAT(M+1)
  800       VPEN(NN,N)=-STB(N)
          ENDIF
C    FOR STANDOFF SLAR SYSTEMS, GENERATE COORDINATES OF LOWER LEFT CORNER
C    AND DIMENSIONS FOR EACH ASSOCIATED MISSION COVERAGE PATTERN.
C
          IF (ICMB(N).EQ.3)  THEN
            NPIECE(N)=NSYS(N)
            LL=NSYS(N)
            DO 900 L=1,LL
              RT(L,N)=0.
              VPEN(L,N)=0.
              HPEN(L,N)=ISWD
  900       UPEN(L,N)=SRANGE-STB(N)
          ENDIF
C
C    IF SYSTEM N IS AN RPV,PATROL ETC,OR IS A COUNTERBATTERY ACOUSTIC
C    SYSTEM,THEN READ THE LOWER LEFT CORNER
C    (X,Y) COORDINATES AND THE X- AND Y- DIMENSIONS OF ALL NPIECE(N)
C    COVERAGE  RECTANGLES OF ALL MISSION PATHS FOR THE SYSTEM.
C    IF SYSTEM N IS A STANO OR CTRBTRY RADAR FOR WHICH THE USER
C    SPECIFIES LOCATIONS(STB(N) .GE. 1000)THEN READ IN THE (X,Y)
C    COORDINATES FOR LOCATIONS OF ALL NSYS(N) EMPLACED RADARS.
C
          IF (ICMB(N).EQ.4.OR.ICMB(N).EQ.2
     +    .OR.(ICMB(N).LE.1.AND.STB(N).GT.1000))  THEN
            M=NPIECE(N)
            IF(ICMB(N).LE.1)M=NSYS(N)
            DO 1000 I=1,M
 1000       READ (5,5500) RT(I,N),VPEN(I,N),HPEN(I,N),UPEN(I,N)
          ENDIF
C
C    READ PROBABILITY OF AVAILABILITY AND SUVIVABILITY FOR SYSTEM N.
C
          READ (5,5600) FA(N),FS(N)
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C   FOR EACH ELEMENT TYPE  READ MAXIMUM SENSOR RANGE(KM) OF SYSTEM N
C   FOR STANO RADARS/FORWARD OBSERVERS AND COUNTERBATTERY RADARS
C
        IF (ICMB(N).LE.1) READ (5,5700) (RNGE(N,JJ),JJ=1,5)
C
C   FOR EACH ELEMENT TYPE:
C      READ INHERENT SINGLE ELEMENT DETECTION PROBABILITY OF SYSTEM N
C      BY SENSOR ZONE.
C      ALSO READ THE MULTIPLIERS WHICH ADJUST THESE INHERENT DETECTION
C      PROBABILITIES FOR EACH ACTIVITY/ENVIRONMENT COMBINATION.READ A
C      RECORD FOR EACH ACTIVITY/ENVIRONMENT (A/E) COMBINATION IN THE SEQUENCE
C      (A/E):(1,1),(1,2),(2,1),(2,2).
C
        DO 1100 IJ=1,IELT
          READ (5,5300) (PDET(IJ,IZ,N),IZ=1,10)
 1100   CONTINUE
        DO 1300 IA=1,2
          DO 1300 IE=1,2
            DO 1200 IJ=1,IELT
 1200       READ (5,5300) (FC(IJ,IZ,N,IA,IE),IZ=1,10)
 1300   CONTINUE
 1400 CONTINUE
C
C   **** TARGET UNIT LOOP- PROCESSES EACH UNIT TYPE. THRU STATEMENT  ********
C        3900 IU DENOTES UNIT TYPE AND ALL CALCULATIONS ARE FOR UNIT
C        TYPE IU.
C
      DO 3400 IU=1,NUMU
        NZ=ZD(NZONE)
C
C   READ THE 'OMIT' FLAG FOR THIS UNIT.
C   READ THE PERSONNEL POSTURE DISTRIBUTION FOR UNIT TYPE IU IN
C   EACH TARGET ZONE.  POSTURE SUBSCRIPTS ARE:
C     1- STANDING
C     2- PRONE
C     3- FOXHOLE
C     4- IN VEHICLES
C   (ONLY STANDING PERSONNEL ARE TREATED IN PROGRAM PROCESSING).
C
        READ (5,5800) IOMIT(IU),(TPOS(IT,1,IU),IT=1,4),UID(IU)
        DO 1500 K=2,NZONE
          READ (5,5900) (TPOS(IT,K,IU),IT=1,4)
 1500   CONTINUE
C
C   **** LOOP READING INPUT FOR EACH ELEMENT TYPE IN UNIT IU ****
C
        DO 2000 J=1,IELT
C
C   READ IN TO&E QUANTITY FOR EACH ELEMENT TYPE IN EACH UNIT TYPE
C   BY TARGET ZONE ALONG WITH THE "OR" LUCRATIVENESS FRACTION AND, FOR
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C     ELT TYPES 2 AND 3 (VEHICLES/CARRIERS),THE "AND" LUCRATIVENESS FRACTION
C     FOR ELT TYPES 4 & 5 (ARTY/MISSILE/MORTAR),READ THE LUCRATIVENESS
C     THRESHOLD IN TERMS OF VOLLEYS FIRED. READ ROUNDS PER VOLLEY AND THE
C     FRACTION OF UNITS (OF THIS UNIT TYPE) WHICH ARE FIRING THIS ELT TYPE
C     DURING THE SCANNING PERIOD.
C
          IF (J.LT.4) READ (5,6000) (IQET(J,K,IU),K=1,10),TPCT(J),TPCT1(
     +    J)
          IF (TPCT1(J).GT.TPCT(J)) TPCT1(J)=TPCT(J)
          IF (J.GE.4) READ (5,6100) (IQET(J,K,IU),K=1,10),TPCT(J),ITRPB(
     +    J),IRPS(J),(PFIR(J,K),K=1,10)
          TPCT(J)=TPCT(J)+TADD
          XXT1(J,IU)=TPCT1(J)
          XXT(J,IU)=TPCT(J)
C
C     READ THE FRACTION OF THE ELEMENT(TYPE J) OF EACH  UNIT TYPE(IU) IN EACH
C     ACTIVITY(IA)/ENVIRONMENT(IE) COMBINATION IN EACH TARGET ZONE(K).
C     NOTE. FOR FIXED IE,J,K,AND IU THE SUM OVER THE FOUR ACTIVITY/ENVIRONMENT
C     COMBINATIONS MUST = 1.
C
          DO 1700 IA=1,2
            DO 1700 IE=1,2
              IF (IA*IE.NE.1) GO TO 1600
              READ (5,6200) (FACT(IA,IE,J,K,IU),K=1,10),(ISAL(J,K),K=1,1
     +        0)
              GO TO 1700
 1600         READ (5,6200) (FACT(IA,IE,J,K,IU),K=1,10)
 1700     CONTINUE
C
C     SET FLAG TO IDENTIFY UNITS WITH NO ARTY/MISSILE/MORTAR ELTS IN ANY ZONE.
C
          IZERO(IU,J)=0
          DO 1800 K=1,NZONE
 1800     IZERO(IU,J)=IZERO(IU,J)+IQET(J,K,IU)
          IF (J.GE.4)  THEN
            DO 1900 K=1,NZONE
              ITHRA(J-3,K,IU)=0
              IF (ISAL(J,K).GT.0) ITHRA(J-3,K,IU)=ITRPB(J)
 1900       CONTINUE
          ENDIF
 2000   CONTINUE
C
C     **** END OF LOOP READING INPUT FOR EACH ELEMENT TYPE IN UNIT IU ****
C
C      IF OMIT FLAG IS .LT. 0, DO NOT PROCESS THIS UNIT
C
        IF (IOMIT(IU).LT.0) GO TO 3400
C
        IF (NSEN.GT.30.OR.NZONE.GT.10)  THEN
          PRINT 6300
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            GO TO 4100
          ENDIF
C
C   COMBINE WEATHER,SMOKE,AND TERRAIN LINE-OF-SIGHT FACTORS INTO
C   ONE FACTOR
C
          DO 2200 I=1,NSEN
            DO 2100 NZ=1,NZONE
              PDEG(NZ,I)=PWEA(I)*PSMO(I)*PCPF(I)*PCD(I)*PWIND(I)
C
 2100       CONTINUE
 2200     CONTINUE
C
C   CALL THE COVERAGE SUBROUTINE TO CALCULATE SINGLE SYSTEM POTAS AND
C   UNIT POTAS FOR UNIT IU ,AVERAGED OVER GRID SQUARES WITH SIDE =XAVG(KK),
C   IN EACH TARGET ZONE.
C
          CALL COVER (IU,IU1)
C
C   AFTER SUBROUTINE COVER IS FINISHED, PUL(K,NI) IS THE
C   PROBABILITY THAT THE SENSOR ARRAY(I.E. ALL EMPLACED SENSORS)
C   OF SYSTEM NI PRODUCES A LUCRATIVE TARGET DECISION WHEN SCANNING
C   UNIT IU IN TGT ZONE K,BASED ON THE THE INPUT LUCRATIVENESS THRESHOLDS.
C   ALSO,PUT(K,JK,NI) IS THE PROBABILITY THAT SYSTEM NI HAS A LUCRATIVE
C   DETECTION DECISION WHEN SCANNING ELTS OF TYPE JK IN UNIT IU AND TGT ZONE
C   K,BASED ON THE "OR" LUCRATIVENESS THRESHOLDS. PUT1(K,JK,NI) IS SAME,EXCEPT
C   THAT IT IS BASED ON "AND" LUCRATIVENESS THRESHOLDS.
C
          KPCNT=0
          DO 2700 NI=1,NSEN
            IF (LUNIT.GT.0) PRINT 6500
            IF (MOD(KPCNT,KP).NE.0.OR.LUNIT.LE.0) GO TO 2400
            PRINT 6600, TD1,ID1
            PRINT 6700
            PRINT 6800
            PRINT 6900, (PCD(L),L=1,NSEN)
            PRINT 7000, TD1,ID1,UID(IU)
            PRINT 7100
 2400       DO 2500 K=1,NZONE
              POTAT(K,NI)=PUL(K,NI)
              INDS(K,NI)=NI
              IF (LUNIT.GT.0) PRINT 7200, NI,SID(NI),ICMB(NI),UID(IU),K,PU
     +        L(K,NI),(PUT(K,JK,NI),JK=1,IELT),(PUT1(K,JK,NI),JK=2,3)
 2500       CONTINUE
            KPCNT=KPCNT+1
C
C   WRITE THE BASIC SINGLE SYSTEM POTA FILE 14 TO BE INPUT TO THE
C   PARAMETRIC CASE POSTPROCESSOR AND TO THE SORT/COUNT POSTPROCESSOR.
C
            IF (NOWRIT.LE.0) GO TO 2700
```

```
          DO 2600 JK=1,IELT
            WRITE (14,7300) NI,SID(NI),IU,UID(IU),JK,(PUT(K,JK,NI),K=1,N
     +      ZONE)
 2600     CONTINUE
          WRITE (14,7300) NI,SID(NI),IU,UID(IU),JK,(PUL(K,NI),K=1,NZONE)
C
 2700   CONTINUE
C
C   RANK ORDER THE SYSTEM ARRAY POTA'S (PUL(K,NI)=POTAT(K,NI))
C
        DO 3000 K=1,NZONE
          DO 2900 NI=1,NSEN-1
            TEMP=POTAT(K,NI)
            IND=NI
            DO 2800 IJ=NI+1,NSEN
              IF (POTAT(K,IJ).LT.TEMP) GO TO 2800
              TEMP=POTAT(K,IJ)
              IND=IJ
 2800       CONTINUE
            XXX=POTAT(K,NI)
            POTAT(K,NI)=TEMP
            POTAT(K,IND)=XXX
            ID=INDS(K,NI)
            INDS(K,NI)=INDS(K,IND)
            INDS(K,IND)=ID
 2900     CONTINUE
 3000   CONTINUE
C
C .....  END LOOP TO RANK ORDER SYSTEM ARRAY POTA'S    .....................
C
        KPCNT=0
C
C   LIST THE RANK ORDERED SYSTEM ARRAY POTA'S AND WRITE THEM TO FILE 12 TO
C   BE INPUT TO THE 'DOMINANT SYSTEM POSTPROCESSOR'.
C
        DO 3300 K=1,NZONE
          IF (MOD(KPCNT,KPSS).NE.0.OR.LUNIT.LE.0) GO TO 3100
          PRINT 6600, TD1,ID1
          PRINT 6700
          PRINT 6800
          PRINT 6900, (PCD(L),L=1,NSEN)
          PRINT 7400, TD1,ID1,UID(IU)
          PRINT 7500
          PRINT 7600
 3100     PRODT=1.
          DO 3200 NI=1,NSEN
            PRODT=PRODT*(1.-POTAT(K,NI))
            NF=INDS(K,NI)
            IF (NOWRIT.GT.0) WRITE (12,7700) IU,UID(IU),NF,SID(NF),K,POT
     +      AT(K,NI),1.-PRODT,(PUT(K,JK,NF),JK=1,IELT),(PUT1(K,JK,NF),JK
```

```
     +        =2,3)
              IF (LUNIT.GT.0) PRINT 7800, NF,SID(NF),ICMB(NF),UID(IU),K,PO
     +        TAT(K,NI),1.-PRODT,(PUT(K,JK,NF),JK=1,IELT),(PUT1(K,JK,NF),J
     +        K=2,3)
 3200       CONTINUE
            KPCNT=KPCNT+1
            IF (LUNIT.GT.0) PRINT 7900
 3300     CONTINUE
C
C   THE UNIT POTA FOR EACH UNIT IU IS CALCULATED AS THE PROBABILITY THAT
C   AT LEAST 1 OF THE SENSOR ARRAYS OF THE PROCESSED SENSOR TYPES PRODUCES A
C   LUCRATIVE DETECTION WHEN SCANNING UNIT TYPE IU IN TARGET ZONE K.
C   THIS IS COMPUTED BY AVERAGING THE UNIT POTA, CALCULATED FOR THE UNIT
C   LOCATED IN SPECIFIC GRID SQUARES WITHIN THE TARGET ZONE K.
C
 3400 CONTINUE
C
C   ---- END OF  TARGET UNIT LOOP          ********************
C
        IF (LTHR.LE.0) GO TO 4100
        DO 3800 IU=1,NUMU
          IF (IOMIT(IU).LT.0) GO TO 3800
          IF (MOD(IU-1,7).NE.0) GO TO 3500
          PRINT 6600, TD1,ID1
          PRINT 8000, TD1,ID1
          PRINT 8100
          PRINT 8200, (ZLAB(K),K=1,NZONE)
          GO TO 3600
 3500     PRINT 8300, (ZLAB(K),K=1,NZONE)
 3600     PRINT 8400, UID(IU)
          DO 3700 J=1,IELT
            IF (J.NE.2.AND.J.NE.3)  THEN
              PRINT 8500, J,XXT(J,IU),(IQET(J,K,IU),K=1,NZONE)
            ELSE
              PRINT 8600, J,XXT1(J,IU),XXT(J,IU),(IQET(J,K,IU),K=1,NZONE)
            ENDIF
 3700     CONTINUE
 3800 CONTINUE
        LPCNT=0
C
C   PRINT ARTY/MISSILE/MORTAR LUCRATIVENESS THRESHOLDS (VOLLEYS REQUIRED)
C   FOR EACH UNIT POSSESSING ARTY/MISSILE/MORTAR ELTS IN SOME TGT ZONE.
C
        DO 4000 IU=1,NUMU
          IF (IOMIT(IU).LT.0) GO TO 4000
          IF (IZERO(IU,4).EQ.0.AND.IZERO(IU,5).EQ.0) GO TO 4000
          IF (MOD(LPCNT,10).NE.0) GO TO 3900
          PRINT 6600, TD1,ID1
          PRINT 6700
          PRINT 6800
```

```
        PRINT 6900, (PCD(L),L=1,NSEN)
        PRINT 8700
        PRINT 8800
 3900   PRINT 8900, UID(IU)
        PRINT 9000
        IF (IZERO(IU,4).GT.0) PRINT 9100, (ITHRA(1,K,IU),K=1,NZONE)
        IF (IZERO(IU,5).GT.0) PRINT 9200, (ITHRA(2,K,IU),K=1,NZONE)
        LPCNT=LPCNT+1
 4000 CONTINUE
 4100 CONTINUE
      PRINT 6600, TD1,ID1
      PRINT 6700
      PRINT 6800
      PRINT 6900, (PCD(L),L=1,NSEN)
      PRINT 9300
      PRINT 9400
      PRINT 9000
C
C   PRINT FINAL UNIT POTA'S
C
      DO 4200 IU=1,NUMU
        IF (IOMIT(IU).LT.0) GO TO 4200
        PRINT 9500, UID(IU),(POTA(K,IU),K=1,NZONE)
        IF (MOD(IU,10).EQ.0) PRINT 6500
 4200 CONTINUE
 4300 FORMAT (1H1)
 4400 FORMAT (A2,I3,F5.2,6I5)
 4500 FORMAT (7I3,3X,I3)
 4600 FORMAT (A2,2I3)
 4700 FORMAT (20F4.2)
 4800 FORMAT (1X,I3,2X,10(2X,F4.0))
 4900 FORMAT (10I5)
 5000 FORMAT (16F5.1)
 5100 FORMAT (10F6.0)
 5200 FORMAT (3X,3(F4.0,1X),I2,A3,F4.2)
 5300 FORMAT (10(F4.0,1X))
 5400 FORMAT (1X,I3,2F6.0,6X,I6,F6.2)
 5500 FORMAT (8F10.4)
 5600 FORMAT (1X,2(F4.0,2X))
 5700 FORMAT (2X,5(1X,F4.0))
 5800 FORMAT (I2,4(1X,F4.0),A3)
 5900 FORMAT (2X,4(1X,F4.0),A3)
 6000 FORMAT (10I4,13F3.2)
 6100 FORMAT (10I4,F3.2,2I3,10F3.1)
 6200 FORMAT (10F4.0,10I4)
 6300 FORMAT ('**ERROR**',2X,'EXCEEDED EITHER 30 SENSORS OR 10 ZONES',1X
     +,'RUN TERMINATED')
 6500 FORMAT (/)
 6600 FORMAT (1H1,5X,'*****  RUN ID= ',A2,I3,'  *****')
 6700 FORMAT (//,30X,' ------  PDET MULTIPLIERS BY SYSTEM TYPE -----',/)
```

```
6800 FORMAT (/,6X,'   1    2    3    4    5    6    7    8    9   10',' 11  12
    + 13   14   15   16   17   18   19   20   21   22   23   24',' 25  26  27  28
    +  29  30',/)
6900 FORMAT (6X,30F4.2)
7000 FORMAT (//,27X,'UNIT',3X,'PROB UNIT IS LUCR (''OR'' THRESH)',2X,'(
    +''AND'' THRESH)')
7100 FORMAT (1X,' SYSTEM TYPE UNIT ZONE',4X,'POTA',2X,' ELT 1 ELT 2 ELT
    + 3 ELT 4 ELT 5',3X,' ELT 2 ELT 3',//)
7200 FORMAT (1X,I3,'/',A3,I5,2X,A3,I5,2X,F6.4,2X,5F6.4,3X,2F6.4)
7300 FORMAT (I10,A3,I5,A3,I3,10F8.6)
7400 FORMAT (//,' RUN ID= ',A2,I3,'  +++++  ORDERED POTA FOR ','EACH SY
    +STEM  VS.  UNIT ',A3,4X,'  +++++',//)
7500 FORMAT (25X,'SYSTEM',4X,'CUM',3X,'PROB UNIT IS LUCR (''OR'' THRESH
    +',')  (''AND'' THRESH)')
7600 FORMAT (1X,' SYSTEM TYPE UNIT ZONE',4X,'POTA',3X,'POTA',2X,' ELT 1
    + ELT 2 ELT 3 ELT 4 ELT 5',3X,' ELT 2 ELT 3',//)
7700 FORMAT (I5,A3,I5,A3,I5,9F8.3)
7800 FORMAT (1X,I3,'/',A3,I5,2X,A3,I5,2X,F6.4,1X,F6.4,2X,5F6.4,3X,2F6.4
    +)
7900 FORMAT (//)
8000 FORMAT (////,4X,'** LUCR THRESHOLD & QUANTITY OF ELEMENTS (','TOE)
    + IN UNIT FOR EACH TARGET ZONE **',////,' UNIT ID')
8100 FORMAT (17X,'LUCRATIVENESS',/,21X,'FRACTIONS')
8200 FORMAT (16X,' (''AND'')  (''OR'')',1X,10A8)
8300 FORMAT (/,32X,2X,10A8)
8400 FORMAT (1X,A3)
8500 FORMAT (8X,'ELT =',I3,6X,F8.2,2X,10I8)
8600 FORMAT (8X,'ELT =',I3,2X,F5.2,2X,F5.2,2X,10I8)
8700 FORMAT (//,17X,'-----  LUCRATIVENESS THRESHOLD (FOR ARTY/MORT','AR
    +S SCANNED BY  COUNTERBTRY SYSTEMS)   --- ')
8800 FORMAT (//,17X,'LUCRATIVENESS THRESHOLDS(MIN VOLLEYS REQUIRED) BY'
    +'TGT  ZONE & ELT TYPE  (''OR'' CONDITIONS)',/)
8900 FORMAT (//,'  ** UNIT',A3)
9000 FORMAT (27X,'I',5X,'II',4X,'III',5X,'IV',6X,'V',5X,'VI',4X,'VII',3
    +X,'VIII',5X,'IX',6X,'X',/)
9100 FORMAT (4X,'ARTY/RKT VOLLEYS',1X,10I7)
9200 FORMAT (5X,'MORTAR VOLLEYS',2X,10I7)
9300 FORMAT (///,7X,'UPDATED PROBABILITY OF OPERATIONAL DETECTION',' (P
    +OTA)  ',/)
9400 FORMAT (/,24X,'ZONE',3X,'ZONE',3X,'ZONE',3X,'ZONE',3X,'ZONE',3X,'Z
    +ONE',3X,'ZONE',3X,'ZONE',3X,'ZONE',3X,'ZONE')
9500 FORMAT (3X,'UNIT ID=  ',A3,5X,10(F6.4,1X),5X,A3)
     END
```

(NOT USED)

SUBROUTINE COVER

```
      SUBROUTINE COVER (IU,IU1)
C
C   FUNCTION: THIS ROUTINE COMPUTES,FOR EACH TARGET ZONE,THE AVERAGE
C   PROBABILITY OF TARGET ACQUISITION (POTA) FOR UNIT IU SEARCHED BY ALL
C   SENSOR SYSTEMS. TO DO THIS, EACH TARGET ZONE,KK, IS PARTITIONED INTO A
C   GRID OF SQUARES ,EACH WITH SIDE XAVG(KK). THE ROUTINE PROCESSES GRID
C   SQUARES ACROSS Y-STRIPS ,EACH OF WIDTH= SECTOR WIDTH AND DEPTH=XAVG(KK),
C   FOR EACH GRID SQUARE,THE ROUTINE COMPUTES THE UNIT POTA FOR TARGET UNIT IU
C   LOCATED IN THAT GRID SQUARE. UNIT POTAS BY GRID SQUARE ARE THEN
C   AVERAGED OVER ALL GRID SQUARES IN A TARGET ZONE TO DETERMINE THE UNIT POTA
C   FOR THE TARGET ZONE .
C
C  *** ARGUMENTS ***
C
C  ARGUMENT                                   DESCRIPTION
C
C  IU                               TARGET UNIT BEING PROCESSED
C
C  IU1                              DURING BINOMIAL CALCULATIONS OF A SCAN OF
C                                   ELTS IN A UNIT,A NORMAL APPROXIMATION TO
C                                   THE BINOMIAL IS USED IF THE NR OF ELTS
C                                   IN THE UNIT (OF THE TYPE BEING PROCESSED)
C                                   EXCEEDS IU1. OTHERWISE THE ACTUAL BINOMIAL
C                                   IS  USED.
C
C   CALLED BY : MAIN PROGRAM(TAS III)
C
C   CALLS : FUNCTION BSUM
C
C   FILES USED : INPUT - NONE
C
C                OUTPUT - PRINT
C
C  *** LOCAL ARRAYS /SIGNIFICANT VARIABLES ***
C
C  NAME               DIMENSION                    DESCRIPTION
C
C  EPNL(J)              5             PROB THE CLUSTER OF ELT TYPE J IN UNIT IU
C                                     IS NOT DETECTED AT THE "OR" LUCRATIVENESS
C                                     LEVEL BY THE SYSTEM BEING PROCESSED
C
C  EPNL1(J)             5             PROB THE CLUSTER OF ELT TYPE J IN UNIT IU
C                                     IS NOT DETECTED AT THE "AND" LUCRATIVENESS
C                                     LEVEL BY THE SYSTEM BEING PROCESSED
C
C  IAND                 1             FLAG (.EQ.0 = NO, .EQ.1 = YES) INDICATING
C                                     WHETHER "AND" LUCRATIVENESS PROCESSING MUST
C                                     ALSO BE DONE FOR UNIT IU
C
C  IKZ(NS)              30            SENSOR ZONE,OF SYSTEM NS, CONTAINING THE
```

```
C                                     GRID SQUARE BEING PROCESSED . SENSOR ZONE
C                                     IS BASED ON DISTANCE FROM THE EMPLACED
C                                     SENSOR BEING PROCESSED.
C
C  IOUT(NS)          30               FLAG (.EQ.0 = NO, .EQ.1 = YES) INDICATING
C                                     WHETHER THE STRIP BEING PROCESSED IS BEYONDO
C                                     THE RANGE OF ALL SENSORS OF SYSTEN NS
C
C  JZ                1                TARGET ZONE BEING PROCESSED. TARGET ZONE IS
C                                     BASED ON DISTANCE FROM FLOT.
C
C  LIMX              1                NUMBER OF GRID SQUARES (ACROSS SECTOR) IN
C                                     EACH Y-STRIP OF THE TARGET ZONE BEING
C                                     PROCESSED
C
C  LIMY              1                NUMBER OF Y-STRIPS IN THE TARGET ZONE
C                                     BEING PROCESSED.
C
C  NAITM(J,IU)       (5,50)           MAXIMUM NUMBER OF SALVOS FIRED BY ELT
C                                     TYPE J IN UNIT IU IN A NONLUCRATIVE ("OR")
C                                     DETECTION
C
C  NN(J,IU)          (5,50)           FOR NONPERSONNEL ELT TYPES (J.GT 1) THIS
C                                     IS THE NUMBER OF ELTS OF TYPE J DEPLOYED
C                                     IN UNIT IU. FOR PERSONNEL (J=1) THIS IS
C                                     THE NUMBER OF STANDING PERSONNEL IN UNIT IU
C
C  NNA(J,IU)         (5,50)           FOR FIRED ROUNDS FROM ELT TYPE J =4 OR 5,
C                                     THIS IS THE MINIMUM NUMBER OF DETECTED
C                                     SALVOS NEEDED FOR A LUCRATIVE DETECTION
C                                     ( = ISAL(J,K))
C
C  NITM(J,IU)        (5,50)           MAXIMUM NUMBER OF DETECTED ELEMENTS OF TYPE
C                                     J,IN UNIT IU, IN A NONLUCRATIVE ("OR"
C                                     CRITERION) DETECTION
C
C  NITM1(J,IU)       (5,50)           MAXIMUM NUMBER OF DETECTED ELEMENTS OF TYPE
C                                     J,IN UNIT IU, IN A NONLUCRATIVE ("AND"
C                                     CRITERION) DETECTION
C
C  NOD(NS,K)         (30,10)          FLAG(.EQ.0 = YES, .EQ.1 = NO) INDICATING
C                                     WHETHER ALL  INHERENT DETECTION
C                                     PROBABILITIES IN ZONE K ARE ZERO.
C
C  PA(NS)            30               PRODUCT OF AVAILABILITY AND SURVIVABILITY
C                                     PROBABILITIES FOR SYSTEM NS.
C
C  PNLUC(KJ)         140              PROBABILITY THAT (NON-ARTY/MORTAR) ELT
C                                     TYPES 1,2,AND 3 IN UNIT IU LOCATED IN THE
C                                     KJ-TH GRID SQUARE OF THE Y-STRIP BEING
```

```
C                                              PROCESSED IS NOT DETECTED AT A LUCRATIVE
C                                              LEVEL ("OR"  + "AND") FROM A SCAN BY ALL
C                                              SCENARIO SYSTEMS
C
C  PNLUCA(IT,KJ)       (2,140)                 PROBABILITY THAT (ARTY/MORTAR) ELT
C                                              TYPE IT+3 IN UNIT IU LOCATED IN THE
C                                              KJ-TH GRID SQUARE OF THE Y-STRIP BEING
C                                              PROCESSED IS NOT DETECTED AT A LUCRATIVE
C                                              LEVEL FROM A SCAN BY ALL SCENARIO SYSTEMS
C
C  PODT(J,JZ,KZ,NS)     (5,10,10,30) FOR AN ELEMENT(TYPE J) IN TARGET ZONE JZ
C                                              AND SENSOR ZONE KZ,THIS IS THE SINGLE
C                                              ELEMENT OPERATIONAL PROBABILITY OF
C                                              DETECTION AND COVERAGE BY A SINGLE
C                                              AVAILABLE AND SURVIVING SENSOR
C                                              OF SYSTEM NS ,ADJUSTED FOR THE DEGRADATION
C                                              FACTORS.
C
C  RMAX(NS)             30                     MAXIMUM SEARCH DISTANCE FROM FLOT OVER
C                                              ALL SENSORS OF SYSTEM NS
C
C  TANG(NS)             30                     TANGENT OF SYSTEM NS
C
C  TANLUC(IT)           2                      PROBABILITY (ARTY/MORTAR) ELT TYPE IT+3
C                                              IN UNIT IU IS NOT DET AT LUC LEVEL BY SYS
C                                              BEING PROCESSED
C
C  XSIDE                 1                     LENGTH OF SIDE OF GRID SQUARE IN TARGET
C                                              ZONE BEING PROCESSED (= XAVG(KK))
C
C  XXS(J)              5                      THIS IS THE PROBABILITY THAT A
C                                             SYSTEM NS DETECTION OF ELT TYPE J IN UN
C                                             IS NOT LUCRATIVE WITH RESPECT TO THE "OR"
C                                             LUCRATIVENESS CONDITIONS.
C
C  XX1S(J)             5                      THIS IS THE PROBABILITY THAT A
C                                             SYSTEM NS DETECTION OF ELT TYPE
C                                             IS NOT LUCRATIVE WITH RESPECT
C                                             LUCRATIVENESS CONDITIONS
C
C  XY                  1                      THE  Y- COORDINATE OF THE
C                                             Y-STRIP BEING PROCESSED
C
C  Y(I,NS)             (110,30)               THE Y-COORDINATE
C                                             SYSTEM NS (APPL
C                                             FORWARD OBSERVER
C
C  ZX1(I,NS,J)         (110,30,5)             LEFTMOST
C                                             OF SYSTEM
C                                             N THE
```

AD-A189 730 TARGET DETECTION ROUTINE (TADER) USER'S GUIDE(U) ARMY 2/2
CONCEPTS ANALYSIS AGENCY BETHESDA MD W J BAUMAN SEP 87
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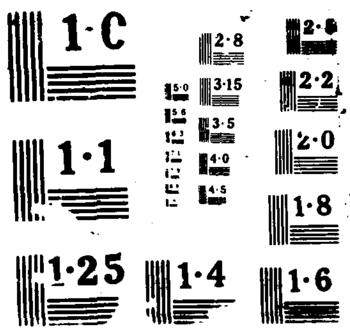
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```
C
C  ZX2(I,NS,J)       (110,30,5)    RIGHTMOST X-COORDINATE OF COVERAGE OF SENSOR
C                                  I OF SYSTEM NS SCANNING ELEMENT TYPE J
C                                  IN THE Y-STRIP BEING PROCESSED
C
C  ZY1(I,NS,J)       (110,30,5)    LOWER (CLOSEST TO FLOT) Y-COORDINATE OF
C                                  COVERAGE OF EACH SENSOR I OF SYSTEM NS
C                                  SCANNING ELEMENT TYPE J IN THE Y-STRIP
C                                  BEING PROCESSED
C
C  ZY2(I,NS,J)       (110,30,5)    UPPER (FURTHEST FROM FLOT) Y-COORDINATE OF
C                                  COVERAGE OF EACH SENSOR I OF SYSTEM NS
C                                  SCANNING ELEMENT TYPE J IN THE Y-STRIP
C                                  BEING PROCESSED
C
      DIMENSION
     +    EPNL(5),            EPNL1(5),            IKZ(30),
     +    IOUT(30),           NAITM(5,50),         NITM(5,50),
     +    NITM1(5,50),        NN(5,50),            NNA(5,50),
     +    NOD(30,10),         PA(30),              PNLUC(140),
     +    PNLUCA(2,140),      PODT(5,10,10,30),    RMAX(30),
     +    TANG(30),           TANLUC(2),           XX1S(5),
     +    XXS(5),             Y(110,30),           ZX1(110,30,5),
     +    ZX2(110,30,5),      ZY1(110,30),         ZY2(110,30)
      COMMON
     +    FA(30),             FACT(2,2,5,10,50),   FC(5,10,30,2,2),
     +    FS(30),             HPEN(110,30),        IAVG(10),
     +    ICMB(30),           IELT,                IQET(5,10,50),
     +    IRPS(5),            ISAL(5,10),          ISWD,
     +    ISZONE(400),        ITRPB(5),            ITZONE(300),
     +    NPIECE(30),         NSEN,                NSYS(30),
     +    NSZONE,             NZFLAG,              NZONE,
     +    PDEG(10,30),        PDET(5,10,30),       PFIR(5,10),
     +    POTA(10,50),        PUL(10,30),          PUT(10,5,30),
     +    PUT1(10,5,30),      PVIS(10,30),         RNGE(30,5),
     +    RT(110,30),         STB(30),             THEA(30),
     +    TPCT(5),            TPCT1(5),            TPOS(4,10,50),
     +    UPEN(110,30),       VPEN(110,30),        XAVG(10),
     +    ZD(10)
C
C   DETERMINE WHETHER 'AND ' LUCRATIVENESS PROCESSING IS REQUIRED FOR UNIT IU.
C
      IAND=0
      DO 100 J=1,IELT
         IF (TPCT1(J).GT..001) IAND=1
  100 CONTINUE
C
C   DETERMINE OPERATIONAL PROBABILITY OF DETECTION ,GIVEN THAT THE SENSOR
C   IS AVAILABLE AND SURVIVING, FOR A SINGLE SENSOR OF SYSTEM NS
C   VS AN ELEMENT IN EACH COMBINATION OF SENSOR ZONE/TARGET ZONE
```

```
C   INCLUDE THE OVERALL DEGRADATION FACTOR WEIGHT FOR THE
C   COMBINATION OF ACTIVITY(IA) AND ENVIRONMENT(IE) ASSOCIATED
C   WITH THE DETECTION OF A TYPE J ELEMENT IN TARGET ZONE JZ BY A SINGLE
C   MISSION OF SYSTEM NS SCANNING SENSOR ZONE KZ. THIS WEIGHT IS
C   MULTIPLIED BY THE INHERENT PROBABILITY OF DETECTION(PDET(J,KZ,NS)) TO
C   ADJUST IT FOR CONDITIONS IN EACH GRID SQUARE STRIP BEING PROCESSED.
C
      DO 200 NS=1,NSEN
        IOUT(NS)=0
        RMAX(NS)=-100.
        PA(NS)=FA(NS)*FS(NS)
        DO 200 J=1,IELT
          DO 200 JZ=1,NZONE
            DO 200 KZ=1,NSZONE
              PODT(J,JZ,KZ,NS)=0.
              DO 200 IA=1,2
                DO 200 IE=1,2
                  PODT(J,JZ,KZ,NS)=PODT(J,JZ,KZ,NS)+FACT(IA,IE,J,JZ,IU)*
     +            PDEG(JZ,NS)*PVIS(KZ,NS)*FC(J,KZ,NS,IA,IE)*PDET(J,KZ,NS
     +            )
  200 CONTINUE
C
C   FOR EACH SENSOR ZONE, DETERMINE IF THE INHERENT PROBABILITY OF DETECTION
C   IS ZERO FOR ALL ELEMENT TYPES SCANNED BY SYSTEM NS
C
      DO 400 K=1,NSZONE
        DO 400 NS=1,NSEN
          PS=0.
          NOD(NS,K)=1
          DO 300 J=1,IELT
  300     PS=PS+PDET(J,K,NS)*PVIS(K,NS)
          IF (PS.LT..0001) NOD(NS,K)=0
  400 CONTINUE
C
C   COMPUTE
C         - UPPER & LOWER Y-BOUNDS AND LEFT & RIGHT X-BOUNDS FOR COVERAGE BY
C           BY EACH SLAR/PENETRATING SENSOR MISSION
C         - MAXIMUM DISTANCE FROM FLOT COVERED ,OVER ALL SENSORS/MISSIONS,
C           BY EACH SYSTEM
C
      DO 700 NS=1,NSEN
        IF (ICMB(NS).GE.2)  THEN
          M=NPIECE(NS)
          DO 500 I=1,M
            ZY2(I,NS)=VPEN(I,NS)+UPEN(I,NS)
            RMAX(NS)=AMAX1(RMAX(NS),ZY2(I,NS))
            ZY1(I,NS)=VPEN(I,NS)
            ZX1(I,NS,1)=RT(I,NS)
            ZX2(I,NS,1)=ZX1(I,NS,1)+HPEN(I,NS)
  500     CONTINUE
```

```
      ENDIF
      IF (ICMB(NS).LE.1)  THEN
        A=THEA(NS)/2.
        TANG(NS)=SIN(A)/COS(A)
        M=NSYS(NS)
        DO 600 I=1,M
          DO 600 J=1,IELT
 600    RMAX(NS)=AMAX1(RMAX(NS),RNGE(NS,J)+VPEN(I,NS))
      ENDIF
 700 CONTINUE
    DO 900 NS=1,NSEN
      DO 900 KK=1,NZONE
        DO 800 J=1,IELT
          PUT(KK,J,NS)=0.
 800    PUT1(KK,J,NS)=0.
 900 PUL(KK,NS)=0.
    NZDL=1
C
C -- FIRST MAJOR LOOP - PROCESSES EACH TARGET ZONE --
C
    DO 3500 KK=1,NZONE
      LSKIP=IAVG(KK)
      POTA(KK,IU)=0.
      DO 1000 J=1,IELT
        NN(J,IU)=IQET(J,KK,IU)
        IF (J.EQ.1) NN(J,IU)=NN(J,IU)*TPOS(1,KK,IU)
        IF (J.GE.4)  THEN
          NNA(J,IU)=ISAL(J,KK)
          NX=MIN0(ITRPB(J),ISAL(J,KK))
          NAITM(J,IU)=MAX0(NX-1,0)
        ENDIF
        NITM(J,IU)=TPCT(J)*NN(J,IU)-.4999
1000  NITM1(J,IU)=TPCT1(J)*NN(J,IU)-.4999
C
C   IF THERE ARE NO TARGET ELEMENTS,OMIT PROCESSING FOR THIS TARGET ZONE.
C
      DO 1100 J=1,IELT
        IF (NN(J,IU).GT.0) GO TO 1200
1100  CONTINUE
      GO TO 3500
C
C   COMPUTE - LIMX = NUMBER OF GRID SQUARES IN TARGET ZONE KK ACROSS X-WIDTH
C                    OF SECTOR.
C           - LIMY = NUMBER OF NIUMBER OF Y-STRIPSIN TARGET ZONE KK
C
1200  IF (KK.GT.1) NZDL=ZD(KK-1)+1
      NZD=ZD(KK)
      XSIDE=AMAX1(1.,XAVG(KK))
      LIMX=FLOAT(ISWD)/XSIDE+.5
      XHALF=XSIDE/2.
```

```
      NUM=NZD-NZDL
      LIMY=FLOAT(NUM+1)/XSIDE+.5
      NSTRIP=(LIMY-1)/LSKIP+1
C
C ---- SECOND MAJOR LOOP - PROCESSES Y- STRIPS IN EACH TARGET ZONE . ----
C   (EVERY LSKIP-TH STRIP IS PROCESSED)
C
      DO 3200 KY=1,LIMY,LSKIP
        XY=NZDL-1+(KY-1)*XSIDE+XHALF
        IY=XY+.50
        JZ=ITZONE(IY)
        DO 1300 NS=1,NSEN
          IF (XY.GT.RMAX(NS)) IOUT(NS)=1
 1300   CONTINUE
C
C   COMPUTE UPPER & LOWER Y-BOUNDS AND LEFT & RIGHT X-BOUNDS FOR COVERAGE EACH
C   SENSOR OF EACH RADAR/FO SYSTEM.
C
        DO 1600 NS=1,NSEN
          IF (ICMB(NS).GE.2)  THEN
            IS=AMAX1(1.,XY+STB(NS)+.4999)
            IKZ(NS)=JZ
            IF (NZFLAG.LE.0.) IKZ(NS)=ISZONE(IS)
          ENDIF
          IF (IOUT(NS).EQ.1) GO TO 1600
          IF (ICMB(NS).LE.1)  THEN
            A=THEA(NS)/2.
            M=NSYS(NS)
            DO 1500 I=1,M
              Y(I,NS)=XY-VPEN(I,NS)
              DO 1400 J=1,IELT
                R=RNGE(NS,J)+XHALF
                IF (Y(I,NS).GT.R.OR.Y(I,NS).LE.0.) GO TO 1400
                IF (Y(I,NS).LE.R*COS(A))  THEN
                  ZX1(I,NS,J)=RT(I,NS)-Y(I,NS)*TANG(NS)
                  ZX2(I,NS,J)=RT(I,NS)+Y(I,NS)*TANG(NS)
                ELSE
                  ZX1(I,NS,J)=RT(I,NS)-SQRT(R*R-Y(I,NS)*Y(I,NS))
                  ZX2(I,NS,J)=RT(I,NS)+SQRT(R*R-Y(I,NS)*Y(I,NS))
                ENDIF
 1400         CONTINUE
 1500       CONTINUE
          ENDIF
 1600   CONTINUE
C
C ------ THIRD MAJOR LOOP - PROCESSES EACH GRID SQUARE IN EACH Y-STRIP ------
C   EACH PROCESSED GRID SQUARE HAS COORDINATES (XY,XJ).
C
        DO 3100 KJ=1,LIMX
          XJ=(KJ-1)*XSIDE+XHALF
```

```
          DO 1700 IQ=1,2
 1700     PNLUCA(IQ,KJ)=1.0
          PNLUC(KJ)=1.0
C
C -------- FOURTH MAJOR LOOP - PROCESSES EACH SENSOR SYSTEM --------
C
          DO 2900 NS=1,NSEN
            DO 1800 J=1,IELT
              EPNL(J)=1.
 1800         EPNL1(J)=1.
C
C   IF Y-STRIP KY IS BEYOND THE RANGE OF ALL SENSORS OF SYSTEM S,OMIT PROCESSING
C   OF THAT SYSTEM.
C
            IF (IOUT(NS).EQ.1) GO TO 2900
            KZ=IKZ(NS)
C
C ***** BEGIN COUNTERBATTERY ACOUSTIC SYSTEM PROCESSING *****
C
            IF (ICMB(NS).EQ.2.AND.NOD(NS,KK).NE.0)  THEN
              PT=0.
              M=NPIECE(NS)
              TANLUC(1)=1.0
              TANLUC(2)=1.0
              DO 2000 J=4,5
                IF (NNA(J,IU).LE.0.OR.NN(J,IU).LE.0) GO TO 2000
                PND=1.
                DO 1900 I=1,M
C
C   CHECK IF GRID SQUARE (XJ,XY) IS COVERED BY SYTEM NS
C
                  IF (XY.LT.ZY1(I,NS).OR.XY.GT.ZY2(I,NS)) GO TO 1900
                  IF (XJ.LT.ZX1(I,NS,1).OR.XJ.GT.ZX2(I,NS,1)) GO TO 19
     +            00
                  P=PODT(J,JZ,KZ,NS)
C
C   COMPUTE - PT = PROB AT LEAST 1 SALVO IS DETECTED BY SYSTEM NS
C            PND = PROB AT LEAST 1 SALVO IS DETECTED BY AT LEAST  1 SENSOR
C                  OF SYSTEM NS
C
                  PT=(1.-(1.-P)**IRPS(J))*FA(NS)*FS(NS)
                  PND=PND*(1.-PT)
 1900           CONTINUE
                ITM=NAITM(J,IU)
                NNN=NNA(J,IU)
                PD=1.-PND
C
C   COMPUTE - XXS(J) = PROB A FIRED RD FROM ELT TYPE J IS NOT DET TO "OR" LUC
C                      LEVEL BY SYSTEM NS
C           - TANLUC(IT) = PROB ELT TYPE IT+3 IN UNIT IS NOT DET TO LUC
```

```
C                       LEVEL BY SYSTEM NS
C
C   COMPUTE PNLUCA(IT,KJ)= PROB ELT TYPE IT+3 IN UNIT IS NOT DETECTED TO
C  LUC LEVEL(IN KJ-TH SQUARE OF STRIP KY) BY ALL SYSTEMS PROCESSED THUS FAR.
C
                  XXS(J)=BSUM(NNN,ITM,PD,IU1)
                  EPNL(J)=EPNL(J)*(1.-PFIR(J,KK)*(1.-XXS(J)))
                  TANLUC(J-3)=TANLUC(J-3)*XXS(J)
                  PNLUCA(J-3,KJ)=PNLUCA(J-3,KJ)*TANLUC(J-3)
 2000          CONTINUE
C
C   COMPUTE SINGLE SYSTEM POTA FOR SYSTEM NS VS UNIT IU IN TGT ZONE KK.
C
               TANLUC(1)=1.-(1.-TANLUC(1))*PFIR(4,KK)
               TANLUC(2)=1.-(1.-TANLUC(2))*PFIR(5,KK)
               PUL(KK,NS)=PUL(KK,NS)+1.-TANLUC(1)*TANLUC(2)
             ENDIF
C
C ***** END COUNTERBATTERY ACOUSTIC SYSTEM PROCESSING *****
C
C ***** BEGIN SLAR/PENETRATING SYSTEM PROCESSING *****
C
             IF ((ICMB(NS).EQ.3.OR.ICMB(NS).EQ.4).AND.NOD(NS,KK).NE.0)
     +        THEN
               TPLS=1.0
               M=NPIECE(NS)
               DO 2200 I=1,M
C
C   CHECK FOR COVERAGE BY MISSION I OF SYSTEM NS
C
                 IF (XY.LT.ZY1(I,NS).OR.XY.GT.ZY2(I,NS)) GO TO 2200
                 IF (XJ.LT.ZX1(I,NS,1).OR.XJ.GT.ZX2(I,NS,1)) GO TO 2200
                 TPNLUC=1.0
                 TPLUC1=.0011
                 DO 2100 J=1,IELT
                   IF (NN(J,IU).LE.0) GO TO 2100
                   ITM=NITM(J,IU)
                   P=PODT(J,JZ,KZ,NS)
                   IF (P.LT..0001) GO TO 2100
                   IF (TPLUC1.EQ..0011) TPLUC1=1.0
                   NNN=NN(J,IU)
C
C   COMPUTE - XXS(J) = PROB ELT TYPE J IS NOT DET TO "OR" LUC BY SYS NS
C           - TPNLUC = PROB UNIT IS NOT DET TO "OR" LUC LEVEL BY SYS NS
C
                   XXS(J)=BSUM(NNN,ITM,P,IU1)
                   EPNL(J)=EPNL(J)*(1.-PA(NS)*(1.-XXS(J)))
                   TPNLUC=TPNLUC*XXS(J)
                   IF (IAND.EQ.0) GO TO 2100
                   IF (TPCT1(J).GT..001)  THEN
```

```
                  ITM1=NITM1(J,IU)
C
C   COMPUTE - XX1S(J) = PROB ELT TYPE J IS NOT DET TO "AND" LUC BY SYS NS
C           - TPLUC1 = PROB UNIT IS NOT DET TO "AND" LUC LEVEL BY SYS NS
C
                  XX1S(J)=BSUM(NNN,ITM1,P,IU1)
                  EPNL1(J)=EPNL1(J)*(1.-PA(NS)*(1.-XX1S(J)))
                  TPLUC1=TPLUC1*(XXS(J)-XX1S(J))
                ELSE
                  TPLUC1=TPLUC1*XXS(J)
                ENDIF
 2100         CONTINUE
              IF (IAND.EQ.0.OR.TPLUC1.EQ..0011) TPLUC1=0.
C
C   COMPUTE TPL = PROB UNIT IS DETECTED TO ("AND"+"OR") LUC LEVEL BY SYS NS.
C   COMPUTE TPLS = PROB UNIT IS NOT DETECTED TO ("AND"+"OR" ) LUC LEVEL BY
C   ALL SYSTEMS PROCESSED THUS FAR.
C   COMPUTE PNLUC(KJ)= PROB (NON-ARTY/MORTAR)ELTS IN UNIT ARE NOT DETECTED TO
C  LUC ("AND" + "OR") LEVEL IN JJ-TH SQUARE OF STRIP KY) BY ALL SYSTEMS
C  PROCESSED THUS FAR.
C
              TPL=(1.-TPNLUC+TPLUC1)*PA(NS)
              PNLUC(KJ)=PNLUC(KJ)*(1.-TPL)
              TPLS=TPLS*(1.-TPL)
 2200       CONTINUE
            PUL(KK,NS)=PUL(KK,NS)+1.-TPLS
C
C ***** END SLAR/PENETRATING SYSTEM PROCESSING *****
          ENDIF
C
C ***** BEGIN RADAR/FORWARD OBSERVER PROCESSING *****
C
          IF (ICMB(NS).EQ.0.AND.NOD(NS,KK).NE.0)  THEN
            TPLS=1.0
            M=NSYS(NS)
            DO 2400 I=1,M
              IS=AMAX1(1.,SQRT(((XJ)-RT(I,NS))**2+Y(I,NS)*Y(I,NS))+.
     +        5)
              KZ=JZ
              IF (NZFLAG.LE.0) KZ=ISZONE(IS)
              TPNLUC=1.0
              TPLUC1=.0011
              DO 2300 J=1,IELT
                R=RNGE(NS,J)+XHALF
                IF (Y(I,NS).GT.R.OR.Y(I,NS).LE.0.) GO TO 2300
                IF (XJ.LT.ZX1(I,NS,J).OR.XJ.GT.ZX2(I,NS,J)) GO TO 23
     +          00
                IF (NN(J,IU).LE.0) GO TO 2300
                ITM=NITM(J,IU)
                P=PODT(J,JZ,KZ,NS)
```

```
                  IF (P.LT..0001) GO TO 2300
                  IF (TPLUC1.EQ..0011) TPLUC1=1.0
                  NNN=NN(J,IU)
                  ITM=NITM(J,IU)
                  XXS(J)=BSUM(NNN,ITM,P,IU1)
                  EPNL(J)=EPNL(J)*(1.-PA(NS)*(1.-XXS(J)))
                  TPNLUC=TPNLUC*XXS(J)
                  IF (IAND.EQ.0) GO TO 2300
                  IF (TPCT1(J).GT..001)  THEN
                    ITM1=NITM1(J,IU)
                    XX1S(J)=BSUM(NNN,ITM1,P,IU1)
                    TPLUC1=TPLUC1*(XXS(J)-XX1S(J))
                    EPNL1(J)=EPNL1(J)*(1.-PA(NS)*(1.-XX1S(J)))
                  ELSE
                    TPLUC1=TPLUC1*XXS(J)
                  ENDIF
 2300           CONTINUE
                IF (IAND.EQ.0.OR.TPLUC1.EQ..0011) TPLUC1=0.
C
C   COMPUTE TPL = PROB UNIT IS DETECTED TO ("AND"+"OR") LUC LEVEL BY SYS NS.
C   COMPUTE TPLS = PROB UNIT IS NOT DETECTED TO ("AND"+"OR" ) LUC LEVEL BY
C   ALL SYSTEMS PROCESSED THUS FAR.
C   COMPUTE PNLUC(KJ)= PROB (NON-ARTY/MORTAR)ELTS IN UNIT ARE NOT DETECTED TO
C  LUC ("AND" + "OR") LEVEL IN JJ-TH SQUARE OF STRIP KY) BY ALL SYSTEMS
C  PROCESSED THUS FAR.
C
                TPL=(1.-TPNLUC+TPLUC1)*PA(NS)
                PNLUC(KJ)=PNLUC(KJ)*(1.-TPL)
                TPLS=TPLS*(1.-TPL)
 2400         CONTINUE
              PUL(KK,NS)=PUL(KK,NS)+1.-TPLS
            ENDIF
C
C ***** END RADAR/FORWARD OBSERVER PROCESSING *****
C
C ***** BEGIN COUNTERBATTERY RADAR PROCESSING *****
C
            IF (ICMB(NS).EQ.1.AND.NOD(NS,KK).NE.0)  THEN
              PT=0.
              TANLUC(1)=1.0
              TANLUC(2)=1.0
              M=NSYS(NS)
              DO 2600 I=1,M
                IS=AMAX1(1.,SQRT(((XJ)-RT(I,NS))**2+Y(I,NS)*Y(I,NS))+.
     +          5)
                KZ=JZ
                IF (NZFLAG.LE.0) KZ=ISZONE(IS)
                DO 2500 J=4,5
                  IF (NNA(J,IU).LE.0.OR.NN(J,IU).LE.0) GO TO 2500
                  R=RNGE(NS,J)+XHALF
```

```
                  IF (Y(I,NS).GT.R.OR.Y(I,NS).LE.0.) GO TO 2500
                  IF (XJ.LT.ZX1(I,NS,J).OR.XJ.GT.ZX2(I,NS,J)) GO TO 25
     +            00
                  P=PODT(J,JZ,KZ,NS)
                  IF (P.LT..0001) GO TO 2500
                  PD=(1.-(1.-P)**IRPS(J))*FA(NS)*FS(NS)
                  NNN=NNA(J,IU)
                  ITM=NAITM(J,IU)
C
C   COMPUTE - XXS(J) = PROB A FIRED RD FROM ELT TYPE J IS NOT DET TO "OR" LUC
C                    LEVEL BY SYSTEM NS
C           - TANLUC(IT) = PROB ELT TYPE IT+3 IN UNIT IS NOT DET TO LUC
C                       LEVEL BY SYSTEM NS
C
                  XXS(J)=BSUM(NNN,ITM,PD,IU1)
                  TANLUC(J-3)=TANLUC(J-3)*XXS(J)
                  EPNL(J)=EPNL(J)*XXS(J)
 2500           CONTINUE
C
C   COMPUTE PNLUCA(IT,KJ)= PROB ELT TYPE IT+3 IN UNIT IS NOT DETECTED TO
C  LUC LEVEL(IN KJ-TH SQUARE OF STRIP KY) BY ALL SYSTEMS PROCESSED THUS FAR.
C
 2600           CONTINUE
                DO 2700 J=4,5
                  EPNL(J)=1.-(1.-EPNL(J))*PFIR(J,KK)
 2700           PNLUCA(J-3,KJ)=PNLUCA(J-3,KJ)*TANLUC(J-3)
                TANLUC(1)=1.-(1.-TANLUC(1))*PFIR(4,KK)
                TANLUC(2)=1.-(1.-TANLUC(2))*PFIR(5,KK)
                PUL(KK,NS)=PUL(KK,NS)+1.-TANLUC(1)*TANLUC(2)
              ENDIF
              DO 2800 J=1,IELT
                PUT(KK,J,NS)=PUT(KK,J,NS)+(1.-EPNL(J))
 2800         PUT1(KK,J,NS)=PUT1(KK,J,NS)+(1.-EPNL1(J))
 2900       CONTINUE
C
C   ADJUST PNLUCA FOR PROBABILITY THAT UNIT IS FIRING
C
            DO 3000 J=4,5
 3000       PNLUCA(J-3,KJ)=1.-(1.-PNLUCA(J-3,KJ))*PFIR(J,KK)
C
C -------- END OF FOURTH MAJOR LOOP
C
            POTA(KK,IU)=POTA(KK,IU)+1.-(PNLUC(KJ)*PNLUCA(1,KJ)*PNLUCA(2,
     +      KJ))
 3100     CONTINUE
C
C ------ END OF THIRD MAJOR LOOP
C
 3200   CONTINUE
C
```

```
C ---- END OF SECOND MAJOR LOOP
C
C   AVERAGE THE POTA VALUES OVER GRID SQUARES TO DETERMINE A ZONE VALUE
C
        POTA(KK,IU)=POTA(KK,IU)/(LIMX*NSTRIP)
        DO 3400 NS=1,NSEN
          DO 3300 J=1,IELT
            PUT(KK,J,NS)=PUT(KK,J,NS)/(LIMX*NSTRIP)
 3300     PUT1(KK,J,NS)=PUT1(KK,J,NS)/(LIMX*NSTRIP)
 3400   PUL(KK,NS)=PUL(KK,NS)/(LIMX*NSTRIP)
 3500 CONTINUE
C
C -- END OF FIRST MAJOR LOOP
C
      RETURN
 3600 FORMAT (20X,3I5,4F8.3)
      END
```

(NOT USED)

FUNCTION BSUM

```
      FUNCTION BSUM (NN,ITM,P,IU1)

C     FUNCTION : THIS ROUTINE CALCULATES THE CUMULATIVE BINOMIAL PROB-
C                ABILITY THAT ITM OR FEWER TYPE J ELEMENTS OUT OF NN IN A UNIT
C                ARE DETECTED,ASSUMING A SINGLE ELEMENT PROBABILITY OF
C                DETECTION OF POD(NS,J,K) FOR SYSTEM NS.
C                IN THE CONTEXT OF TAS  III,(ITM+1) IS THE LUCRATIVENESS
C                THRESHOLD EXPRESSED AS MINIMUM DETECTIONS NEEDED TO HAVE
C                A LUCRATIVE TARGET. BSUM THEN COMPUTES THE PROBABILITY THAT
C                A SCAN OF NN ELEMENTS DOES NOT RESULT IN A LUCRATIVE TARGET
C                DECISION.
C
C    *** ARGUMENTS ***
C
C    ARGUMENT                                    DESCRIPTION
C
C    NN                              NUMBER OF ELEMENTS OF TYPE J IN UNIT IU
C
C    ITM                             THE NUMBER(OF DETECTIONS) FOR WHICH THE
C                                    CUMULATIVE BINOMIAL PROBABILITY(THAT
C                                    DETECTIONS WILL NOT EXCEED THIS NUMBER)
C                                    IS CALCULATED BY THIS ROUTINE.
C
C    P                               SINGLE ELEMENT PROBABILITY OF DETECTION
C
C    IU1                             DURING  BINOMIAL CALCULATIONS OF A SCAN OF
C                                    ELTS IN A UNIT,A NORMAL APPROXIMATION TO
C                                    THE BINOMIAL IS USED IF THE NR OF ELTS
C                                    IN THE UNIT (OF THE TYPE BEING PROCESSED)
C                                    EXCEEDS IU1. OTHERWISE THE ACTUAL BINOMIAL
C                                    IS  USED.
C
C     CALLED BY : SUBROUTINE COVER
C
C     CALLS : NONE
C
C     FILES USED : INPUT - NONE
C
C                 OUTPUT - NONE
C
       DOUBLE PRECISION
     +     QOD,            XFAC,           XI,            XN,
     +     XP,             XQ,             XR
      XM=6.
      XP=P
      XQ=1.-P
      POR=1.
      IF (NN.GT.50) XM=4.
      XN=NN
      IF (NN.EQ.0.OR.ITM.GT.NN.OR.P.LT..0000001) BSUM=1.0
```

```
      IF (NN.EQ.0.OR.ITM.GT.NN.OR.P.LT..0000001) GO TO 600
      IR=0
      IF (ITM.LT.0) ITM=0
      BSUM=(1.0-P)**NN
      IF (ITM.LT.1) GO TO 600
      BNOM=0.0
      Z=NN*P*(1.-P)
      ZZ=SQRT(Z)
C
C  IF NN .GE. IU1 , USE A  NORMAL APPROXIMATION TO COMPUTE THE BINOMIAL TERMS.
C
      IF (NN.LT.IU1) GO TO 100
      ZM=NN*P
      ZI=ITM
      SZ=(ZI+.5-ZM)/ZZ
      IF (ABS(SZ).LT..00001) SZ=SZ+.00001
      ASZ=ABS(SZ)
      BSZ=AMIN1(ASZ,4.)
      X=BSZ/1.4142
      A1=.070523
      A2=.042282
      A3=.0092705
      A4=.000152
      A5=.00027656
      ZP=1.+A1*X+A2*X**2+A3*X**3+A4*X**4+A5*X**5
      ZP=1.-1./ZP**16
      BSUM=ZP/2.
      BSUM=(BSUM*ASZ/SZ)+.50
      RETURN
C
C  DIRECTLY CALCULATE THE BINOMIAL TERMS ONLY FOR VALUES WITHIN ( XM STANDARD
C  DEVIATIONS +3)  FROM THE MEAN (TREAT THE REST AS =0).
C
  100 XLBND=NN*P-XM*ZZ-3.
      XLBND=AMAX1(1.,XLBND)
      MBND=XLBND+2.*XM*ZZ+3.
      LBND=XLBND
      MBND=MINO(ITM,MBND)
C
      DO 500 IR=LBND,MBND
        XFAC=XP**NN
        IF (IR.EQ.NN) GO TO 400
        XFAC=1.0D0
        IF (IR.GT.1) GO TO 200
        XFAC=DFLOAT(NN)*XP
        GO TO 400
  200   DO 300 II=1,IR
          XI=II-1
          XR=IR
  300   XFAC=XFAC*XP*(XN-XI)/(XR-XI)
```

```
  400   QOD=XQ**(NN-IR)
        BNOM=XFAC*POR*QOD
        BSUM=BSUM+BNOM
C
C   IF THE BINOMIAL TERMS ARE SMALL ENOUGH AND DECREASING,TREAT THE REMAINING
C   TERMS AS =0 AND STOP.
C
        IF (BSUM.GT..95.AND.BNOM.LT..002) GO TO 600
  500 CONTINUE
  600 BSUM=AMIN1(1.,BSUM)
      END
```

(NOT USED)

APPENDIX B

DATA DISPLAY PROCESSOR SOURCE CODE

(NOT USED)

DATA DISPLAY PROCESSOR

```
C     THIS ROUTINE IS A DATA DISPLAY PROCESSOR WHICH DISPLAYS THE INPUT
C     DATA BASE FOR THE TARGET DETECTION ROUTINE (TADER).
C
C                        ** VARIABLE DICTIONARY **
C
C  *** LOCAL VARIABLES ***
C
C  NAME                 DIMENSION                    DESCRIPTION
C
C  CFRAC(K)             10              THE FRACTION OF ALL STRIPS(OF UNIT DEPTH)
C                                       IN TARGET ZONE K WHICH ARE PROCESSED IN
C                                       THIS RUN.
C
C  FA(I)                30              PROBABILITY(FRACTION TIME) THAT A SENSOR
C                                       OF SYSTEM TYPE I IS AVAILABLE('SENSING).
C
C  FACT(IA,IE,J,K,IU) (2,2,5,10,50) FRACTION OF ELEMENTS OF ELT TYPE J IN
C                                       UNIT IU & TARGET ZONE K WHICH ARE IN
C                                       ACTIVITY STATE IA AND ENVIRONMENT
C                                       STATE IE . THESE ARE :
C
C                                       ACTIVITY STATE 1-MOVING
C                                       ACTIVITY STATE 2-NOT MOVING
C                                       ENVIRONMENT STATE 1-IN OPEN TERRAIN
C                                       ENVIRONMENT STATE 2-IN WOODS/TOWNS
C
C                                       THESE COMPRISE ALL ELEMENT ACTIVITY
C                                       AND ENVIRONMENT STATES. HENCE, FOR
C                                       FIXED J,K,IU, THE FACT(IA,IE,,,) MUST
C                                       SUM TO 1.00 OVER THE 4 ACTIVITY /
C                                       ENVIRONMENT COMBINATIONS.
C
C  FC(J,K,I,IA,IE)     (5,10,30,2,2) FRACTION OF INHERENT DETECTION CAPABILITY
C                                       APPLICABLE TO A SINGLE SENSOR OF TYPE I
C                                       SCANNING A SINGLE ELEMENT OF TYPE J IN
C                                       SENSOR ZONE K AND IN ACTIVITY IA AND
C                                       ENVIRONMENT IE. I.E. THIS IS A MULTIPLIER
C                                       OF PDET(J,K,I) WHICH ADJUSTS THE PROBABILITY
C                                       OF DETECTION UNDER IDEAL CONDITIONS TO ONE
C                                       UNDER ACTIVITY A AND ENVIRONMENT E.
C
C                                       WITH THE STRIP & EMPLACED SENSOR BEING
C                                       PROCESSED IN THE SUBROUTINE COVER.
C
C  FS(I)                30              PROBABILITY THAT A SENSOR OF SYSTEM TYPE I
C                                       IS NOT DESTROYED.
C
C  HPEN(N,I)           (110,30)         USED ONLY FOR I WITH ICMB(I)=4(RPV,PATROL..)
C                                       OR WITH ICMB(I)=2 (CBTRY ACOUSTIC).
```

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C                                         THE HORIZONTAL(PARALLEL TO FEBA) DIMENSION
C                                         OF THE N-TH COVERAGE RECTANGLE OF THE
C                                         THE MISSIONS OF SYSTEM I.
C
C  IAVG(K)          10                    INPUT PARAMETER REGULATING PROCESSING
C                                         OF STRIPS. DURING PROCESSING,ONLY EVERY
C                                         N-TH STRIP OF UNIT DEPTH IS PROCESSED,
C                                         WHERE N=IAVG(K).
C
C  ICMB(I)          30                    THE TYPE OF SENSOR SYSTEM CHARACTERIZING
C                                         SYSTEM I:
C                                         ICMB=0 FOR STANO RADAR& STATIONARY GND OBSV
C                                         ICMB=1 FOR COUNTERBTRY/COUNERMORTAR RADAR
C                                         ICMB=2 FOR COUNTERBTRY ACOUSTIC
C                                         ICMB=3 FOR STANDOFF AIR RADAR(SLAR)
C                                         ICMB=4 FOR RPV,PATROL,PENETRATING ABN RADAR
C
C  ID1              1                     NUMERIC PART OF RUN ID.
C
C  IELT             1                     NUMBER OF ELEMENT TYPES PROCESSED
C
C  IOMIT(IU)J)      50                    FLAG  CONTROLLING PROCESSING OF
C                                         EACH UNIT. IF IOMIT(IU) .LT. 0,THEN
C                                         UNIT IU WILL NOT BE PROCESSED.
C
C  IQET(J,K,IU)     (5,10,30)             NUMBER OF TO&E ELEMENTS OF TYPE J IN UNIT I
C                                         WHEN IN TARGET ZONE K.
C
C  IRPS(J)          5                     NUMBER OF ROUNDS FIRED PER VOLLEY BY
C                                         ARTY/MISSILE/RKT ELTS OF TYPE J IN
C                                         THE UNIT BEING PROCESSED (ONLY APPLICABLE
C                                         TO ELT TYPES 4 & 5)
C
C  ISAL(J,K)        (5,10)                NUMBER OF ARTY/RKT/MISSILE VOLLEYS FIRED
C                                         IN THE UNIT BEING PROCESSED IN TGT
C                                         ZONE K BY THE CLUSTER OF ELTS OF TYPE J.
C                                         (ONLY APPLICABLE TO ELT TYPES 4 & 5)
C
C  ISWD             1                     SECTOR(FEBA) WIDTH(KM)
C
C  ITRPB(J)         (5)                   THE LUCRATIVENESS THRESHOLD FOR VOLLEYS
C                                         FIRED FROM  ALL ARTY/MISSILE/RKT ELTS OF
C                                         TYPE J (J=4,5) IN ALL TARGET ZONES FOR
C                                         UNIT IU. IT=ITRPB(J) (INPUT) FOR THE UNIT
C                                         BEING PROCESSED.
C
C  NPIECE(I)        30                     FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR
C                                         & FOR ICMB(I)=2(COUNTERBATTERY ACOUSTIC)
C                                         THIS IS THE NUMBER OF COVERAGE RECTANGLES
C                                         IN THE MISSIONS OF SYSTEM TYPE I.
```

```
C                                              CURRENTLY THE VALUE OF NPIECE(I) SHOULD BE
C                                              .LE. 110 FOR EACH I.
C
C                                              FOR ICMB(I)=0,1, OR 3,THIS VALUE IS IGNORED
C
C  NSYS(I)                                     FOR ICMB(I)=0,1(STATIONARY RADARS & OBSERVER
C                                              THIS IS THE NUMBER OF EMPLACED SENSORS OF
C                                              SYSTEM TYPE I.
C
C                                              FOR ICMB(I)=3(SLAR) THIS IS THE NUMBER OF
C                                              MISSIONS OF SYSTEM TYPE I.
C
C                                              FOR ICMB(I)=4,1(RPV,PATROL,PENETR RADARS)
C                                              & FOR ICMB(I)=2(COUNTERBATTERY ACOUSTIC)
C                                              THIS VALUE IS IGNORED.
C
C  NSZONE             1                        NUMBER OF SENSOR SURVEILLANCE ZONES.
C                                              THESE ARE BASED ON DISTANCE FROM EMPLACED
C                                              SENSOR.
C
C  NZFLAG             1                        FLAG CONTROLLING PROCESSING OF INHERENT
C                                              SENSOR DETECTION DATA(PDET),VIZ:
C
C                                               NZFLAG=0 MEANS THAT INHERENT SENSOR
C                                              DETECTION DATA FOR A TGT IS PROCESSED
C                                              BASED ON THE SENSOR ZONE THE TGT IS IN.
C
C                                               NZFLAG=1 MEANS THAT INHERENT SENSOR
C                                              DETECTION DATA FOR A TGT IS PROCESSED
C                                               BASED ON THE TARGET ZONE IN WHICH THE
C                                              TARGET IS LOCATED.
C
C  NZONE              1                        NUMBER OF TARGET LOCATION ZONES.
C                                              THESE ARE BASED ON DISTANCE FROM FLOT.
C
C  PCD(I)             30                       THE SCALE FRACTION APPLIED TO THE INPUT
C                                              VALUES OF INHERENT PROBABILITIES OF
C                                              DETECTION FOR SYSTEM I.
C
C  PCPF(I)            30                       PROBABILITY OF SUCCESSFUL(NONDEGRADED)
C                                              CREW  PERFORMANCE FOR SYSTEM I.
C
C  PDEG(K,I)          (10,30)                  THE PRODUCT OF THE WEATHER,WIND,SMOKE,
C                                              CREW PERFORMANCE,VISIBILITY AND SCALE
C                                              NON-DEGRADATION FACTORS FOR SYSTEM I
C                                              SCANNING IN  TARGET  ZONE K.
C
C  PDET(J,K,I)        (5,10,30)                INHERENT PROBABILITY OF DETECTION=
C                                              PROBABILITY THAT A SINGLE SENSOR OF
C                                              SYSTEM I WILL DETECT A SINGLE ELEMENT OF
```

```
C                                   TYPE J IN AN IDEAL ENVIRONMENT IN SENSOR
C                                   ZONE K
C
C  PFIR(J,K)          (5,10)        THE FRACTION OF UNITS(OF THE UNIT TYPE
C                                   BEING PROCESSED) WHICH ARE FIRING
C                                   ARTY/MISSILES/RKTS FROM ELT TYPE J IN
C                                   TARGET ZONE K.
C
C  PSMO(I)            (30)          PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                   FROM SMOKE.
C
C  PVIS(L,I)          (10,30)       PROBABILITY OF AN UNOBSTRUCTED LINE-OF-
C                                   SIGHT FROM A SENSOR OF SYSTEM I TO A TARGET
C                                   ELEMENT IN TARGET ZONE L.
C
C  PWEA(I)            (30)          PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                   FROM WEATHER EFFECTS.
C
C  PWIND(I)           (30)          PROBABILITY OF NO DEGRADATION TO SYSTEM I
C                                   FROM WIND EFFECTS.
C
C  RNGE(I,J)          (30,5)        MAXIMUM RANGE OF SYSTEM I VS. A SINGLE
C                                   ELEMENT OF TYPE J.
C
C  ST(M)              5             NAME OF SYSTEM TYPE M (VALUES FOR ICMB
C                                   ARRAY).
C
C  RT(N,I)           (110,30)       USED ONLY WHEN ICMB(I)=0,1,2  OR 4.
C                                   FOR ICMB(I)=0,1(STATIONARY RADARS,OBSERVERS)
C                                   THIS IS THE HORIZONTAL(X-) COORDINATE OF
C                                   THE N-TH EMPLACED SENSOR OF SYSTEM TYPE I.
C                                   FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR)
C                                   OR FOR ICMB(I)=2(COUNERTBATTERY ACOUSTIC)
C                                   THIS IS THE HORIZONTAL(X-)COORDINATE OF THE
C                                   N-TH COVERAGE RECTANGLE FOR MISSIONS OF
C                                   SYSTEM I.
C                                   (COORDINATES ARE RELATIVE TO ORIGIN AT
C                                   LOWER LEFT CORNER OF SECTOR)
C
C  SID(I)             (30)          THE (INPUT) ALPHABETIC ID FOR SENSOR SYSTEM
C                                   I.
C
C  STB(I)             (30)          USED ONLY WHEN ICMB(I)=3(SLAR) OR WHEN
C                                   ICMB(I)=0 OR 1(STANO,CBTRY RADARS).
C
C                                   WHEN ICMB(I)=3(SLAR) THIS IS THE
C                                   STANDOFF(KM) OF THE SLAR PATH RELATIVE TO
C                                   THE FEBA. (THE SLAR PATH IS ASSUMED
C                                   PARALLEL TO FEBA AND WITH LENGTH=SECTOR
C                                   WIDTH).
```

```
C
C                                        WHEN ICMB(I)=0 OR 1 AND STB(I) .LT. 1000
C                                        THIS IS THE STANDOFF OF ALL SENSORS OF TYPE
C                                        I UNDER THE ASSUMPTION THAT THEY ARE
C                                        EMPLACED ON A LINE PARALLEL TO THE FEBA.
C                                        THE PROGRAM THEN GENERATES THE SENSOR
C                                        LOCATIONS. IF ICMB(I) .EQ. 0 OR 1 AND
C                                        STB(I) .GE. 1000 THEN THE LOCATIONS OF THE
C                                        SENSORS IS READ FROM USER INPUT.
C
C  TD1                 1                 CHARACTER PART OF RUN ID.
C
C  THEA(I)             (30)              USED ONLY WHEN ICMB(I)=0(STANO RADAR)
C                                        THIS IS THE SCAN ANGLE,IN RADIANS,OF THE
C                                        RADAR OF SYSTEM TYPE N.
C
C  TID(I)              30                SYSTEM NAMES AS INPUT ON UNIT 5.
C
C  TPCT(J)             (5)               (TPCT(J)+TADD) IS THE 'OR' LUCRATIVENESS
C                                        FRACTION WHICH,WHEN MULTIPLIED BY UNIT
C                                        TO&E(IQET(J,K,IU)),YIELDS THE LUCRATIVENESS
C                                        THRESHOLD APPLIED SEPARATELY UNDER
C                                        'OR' CONDITIONS TO EACH ELEMENT TYPE
C                                        J IN TARGET ZONE K IN UNIT TYPE IU.
C
C  TPCT1(J)            (5)               TPCT1 IS THE 'AND' LUCRATIVENESS FRACTION
C                                        FRACTION,ONLY APPLIED TO ELT TYPES 2 & 3
C                                        (VEHICLES) WHICH,WHEN MULTIPLIED BY UNIT
C                                        TO&E(IQET(J,K,IU)),YIELDS THE LUCRATIVENESS
C                                        THRESHOLD APPLIED JOINTLY UNDER
C                                        'AND' CONDITIONS TO BOTH ELEMENT TYPES
C                                        J=2,3 IN TARGET ZONE K IN UNIT TYPE IU.
C
C  TPOS(MM,K,IU)       (4,10,50)         FRACTION OF PERSONNEL IN UNIT IU AND
C                                        TARGET ZONE K WHO ARE IN POSTURE MM.
C                                        POSTURES ARE:
C                                         1=STANDING
C                                         2=PRONE
C                                         3=VEHICLE MOUNTED
C                                         4=FOXHOLE
C
C  TZ(K)               10                LABEL FOR TARGET ZONE K.
C
C  UID(IU)             50                THE (INPUT) ALPHABETIC ID FOR UNIT IU.
C
C  UNAME(IU)           50                UNIT NAME FOR UNIT IU AS INPUT ON UNIT 5.
C
C  UPEN(N,I)          (110,30)           USED ONLY WHEN ICMB(I)=4(RPV,PATROL)
C                                        OR WHEN ICMB(I)=2 (COUNTERBATTERY ACOUSTIC)
C                                        THE VERTICAL(PERPENDICULAR TO FEBA)
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```
C                                          DIMENSION OF THE N-TH COVERAGE RECTANGLE
C                                          OF THE MISSIONS OF SYSTEM I.
C
C  VPEN(N,I)          (110,30)             USED ONLY WHEN ICMB(I)=0,1,2  OR 4.
C                                          FOR ICMB(I)=0,1(STATIONARY RADARS,OBSERVERS)
C                                          THIS IS THE VERTICAL(Y-) COORDINATE OF
C                                          THE N-TH EMPLACED SENSOR OF SYSTEM TYPE I.
C                                          FOR ICMB(I)=4(RPV,PATROL,PENETR ABN RADAR)
C                                          OR FOR ICMB(I)=2(COUNTERBATTERY ACOUSTIC)
C                                          THIS IS THE VERTICAL(Y-)COORDINATE OF THE
C                                          N-TH COVERAGE RECTANGLE FOR MISSIONS OF
C                                          SYSTEM  I.
C                                          (COORDINATES ARE RELATIVE TO ORIGIN AT
C                                          LOWER LEFT CORNER OF SECTOR)
C
C  XINT(I)             30                  RESOLUTION(KM) OF THE COVERAGE  GRID USED
C                                          DURING COVERAGE CALCULATIONS FOR SYSTEM I.
C                                          THIS IS THE SIDE LENGTH OF EACH
C                                          GRID SQUARE SCANNED IN SUBROUTINE COVER.
C
C  XXX(J,IU)           (5,50)              SAME AS TPCT(J) FOR ELT TYPE J IN UNIT IU.
C
C  XXY(J,IU)           (5,50)              SAME AS TPCT1(J) FOR ELT TYPE J IN UNIT IU.
C
C  ZD(K)               10                  DISTANCE(KM)FROM FEBA OF THE UPPER(REARMOST)
C                                          BOUNDARY OF TARGET ZONE K.
C
C  ZDS(KS)              10                  DISTANCE(KM),FROM THE EMPLACED SENSOR,OF
C                                          THE UPPER(FURTHEST) BOUNDARY OF SENSOR
C                                          ZONE KS.
C
C  ZLAB(K)             10                  LABEL FOR TARGET ZONE K AS INPUT ON UNIT 5.
C
      DIMENSION
     +    CFRAC(10),           FA(30),
     +                         FS(30),              HPEN(110,30),
     +    IAVG(10),            ICMB(30),            IOMIT(50),
     +   XAVG(10),             IRPS(5),             ISAL(5,10),
     +    ITRPB(5),            NPIECE(30),          NSYS(30),
     +    PCD(30),             PCPF(30),            PDEG(10,30),
     +      PA(30),                    PFIR(5,10),
     +    PSMO(30),            PVIS(10,30),         PWEA(30),
     +    PWIND(30),           RNGE(30,5),          RT(110,30),
     +    STB(30),             THEA(30),
     +                                              UPEN(110,30),
     +    VPEN(110,30),
     +                         ZD(10),              ZDS(10)
      CHARACTER*15
     +    ST(6)
      CHARACTER*16
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```
     +    ZIND
      CHARACTER*3
     +    SID(30), TZ(10),UID(50),TPCT(5),TPCT1(5),XXX(5,50),XXY(5,50)
      CHARACTER*4
     +    PDET(5,10,30),FC(5,10,30,2,2),IQET(5,10,50),TPOS(4,10,50),
     +    FACT(2,2,5,10,50)
      CHARACTER*8
     +    ZLAB(10)
      CHARACTER*10
     +    TID(30),            UNAME(50)
      ST(1)='= STANO RADAR  '
      ST(2)='= CBTRY RADAR  '
      ST(3)='= CBTRY PENETR '
      ST(4)='=STANDOFF SLAR '
      ST(5)='=PENETR SENSOR '
      ST(6)='=PENETR SENSOR '
      TZ(1)='  I'
      TZ(2)=' II'
      TZ(3)='III'
      TZ(4)=' IV'
      TZ(5)='  V'
C
C    READ NR UNIT TYES,NR ELEMENT TYPES,NR (SENSOR) SYSTEM TYPES,NR TARGET
C    ZONES,DEBUG PRINT FLAGS,NR SENSOR ZONES,MAX MULTIPLICITY RESOLVED.
C
C    READ NR UNITS,NR ELEMENT TYPES,NR (SENSOR) SYSTEM TYPES,NR TARGET
C    ZONES,PRINT/DEBUG FLAGS,NR SENSOR ZONES,MAXIMUM MULTIPLICITY
C    READ SECTOR WIDTH AND 'UPPER' TARGET ZONE BOUNDARIES.
C    READ 'UPPER' SENSOR ZONE BOUNDARIES.
C
      PRINT 3600
      READ (5,3700) NSEN,NUMU
      READ (5,3800) (TID(I),I=1,NSEN)
      READ (5,3800) (UNAME(I),I=1,NUMU)
      READ (5,3900) (ZLAB(I),I=1,10)
C
C    READ RUN ID
C
      READ (5,4000) TD1,ID1,TADD,IU1
C    READ NR UNIT TYES,NR ELEMENT TYPES,NR (SENSOR) SYSTEM TYPES,NR TARGET
C    ZONES,PRINT FLAGS,NR SENSOR ZONES,MAXIMUM MULTIPLICITY RESOLVED AND
C    SENSOR/TARGET ZONE PROCESSING FLAG.
C
C    READ SCALING FRACTION FOR EACH SENSOR SYSTEM TYPE. THESE ARE APPLIED
C    TO THE INPUT SENSOR SYSTEM INHERENT PROBABILITIES  OF DETECTION.
C    READ SECTOR WIDTH AND 'UPPER' TARGET ZONE BOUNDARIES.
C    READ 'UPPER' SENSOR ZONE BOUNDARIES.
C    READ THE SAMPLING DENSITY FOR EACH TARGET ZONE I.(ONLY EVERY IAVG(I)-TH
C    'STRIP' IN TARGET ZONE I IS PROCESSED IN SUBROUTINE COVER)
C
```

```
      READ (5,4100) NUMU,IELT,NSEN,NZONE,LUNIT,LTHR,NSZONE,NZFLAG
      READ (5,4200) (PCD(L),L=1,NSEN)
      READ (5,4300) ISWD,(ZD(I),I=1,10)
      READ (5,4400) (IAVG(I),I=1,10)
      READ (5,4410) (XAVG(I),I=1,10)
      READ(5,4500) (ZDS(I),I=1,10)
      ZDL=0.
      DO 100  K=1,NZONE
      ISKIP=MAX0(1,IAVG(K))
      IF(K .GT.1)ZDL=ZD(K-1)
      N1=ZD(K)-ZDL
      NPT=N1/ISKIP
  100 CFRAC(K)=FLOAT(NPT)/FLOAT(N1)
C
C   PRINT TABLE 1 ** DATA SET INFORMATION **
C
      IF(NZFLAG .LE.0)THEN
      ZIND='DIST FROM SENSOR'
      ELSE
      ZIND='DIST FROM FLOT   '
      ENDIF
      PRINT 4600
      PRINT 4700, TD1,ID1
      PRINT 4800
      PRINT 4900
      PRINT 5000, NUMU,IELT,NZONE,NSEN,NSZONE,ZIND
      PRINT 5100
      PRINT 5200, (TID(I),I=1,NSEN)
      PRINT 5300, (PCD(I),I=1,NSEN)
      PRINT 5350,TADD
      PRINT 5360,IU1
C
C   PRINT TABLE 2 ** TARGET ZONE STRUCTURE **
C
      PRINT 5400, TD1,ID1
      PRINT 5500, (ZLAB(K),K=1,NZONE)
      PRINT 5600, ISWD,(ZD(K),K=1,NZONE)
      PRINT 5700
      PRINT 5800
      PRINT 5900, (ZLAB(K),K=1,NZONE)
      PRINT 5800
      PRINT 5950, (ZDS(K),K=1,NZONE)
      PRINT 6100
      PRINT 6200, (ZLAB(K),K=1,NZONE)
      PRINT 5800
      PRINT 6000, (CFRAC(K),K=1,NZONE)
      PRINT 6300, (IAVG(K),K=1,NZONE)
      PRINT 6310
      PRINT 6200, (ZLAB(K),K=1,NZONE)
      PRINT 6330, (XAVG(K),K=1,NZONE)
```

```
C
C     THRU STMT  900 READ SENSOR CHARACTERISTIC DATA FOR EACH (SENSOR)SYSTEM
C     TYPE N FOR N=1....NSEN.
C
      DO 900 N=1,NSEN
C
C   READ PROB OF NO DEGRADATION BY WEATHER,SMOKE,CREW PERFORMANCE,AND WIND,
C   ALONG WITH NUMERIC CODE (ICMB(N)) FOR SENSOR SYSTEM TYPE AND SYSTEM ID.
C   READ PROB OF CLEAR LINE OF SIGHT(EXCLUDING SMOKE & WX) BY TARGET ZONE.
C
        READ (5,6400) PWEA(N),PSMO(N),PCPF(N),ICMB(N),SID(N),PWIND(N)
        READ (5,6550) (PVIS(IZO,N),IZO=1,10)
C
C   READ NUMBER OF EMPLACED SENSORS(OR NR MISSIONS)-THIS IS DISREGARDED
C   WHEN ICMB(N)=4 (RPV) OR WHEN ICMB(N)=2 (COUNTERBATTERY ACOUSTIC).
C   ALSO READ STANDOFF DISTANCE OF SLAR (OR OF STANO AND COUNTERBATTERY
C   RADARS WHEN THE PROGRAM GENERATES THEIR LOCATIONS),SCAN ANGLE,LENGTH
C   OF SIDE OF GRID SQUARE USED IN SUBROUTINE COVER,AND NUMBER OF
C   COVERAGE RECTANGLES ASSOCIATED WITH A PENETRATING SENSOR TYPE
C   (RPV,PATROL,AIRBORNE RADAR).
C
       READ (5,6600) NSYS(N),STB(N),THEA(N),NPIECE(N),SRANGE
C
C   TEST IF WHETHER THIS IS A RADAR SYSYTEM FOR WHICH THE PROGRAM
C   MUST GENERATE SENSOR LOCATIONS.
C
        IF (STB(N).LT.1000.AND.ICMB(N).LE.1)THEN
C
C   FOR ICMB(N)=0 OR 1, GENERATE LOCATIONS OF ALL M EMPLACED SENSORS
C   SPACED AT UNIFORM INTERVALS ON A LINE AT STB(N) STANDOFF FROM
C   THE FEBA  AND PARALLEL TO IT.
C
      M=NSYS(N)
        DO 200 NN=1,M
          RT(NN,N)=ISWD*NN/(M+1)
  200   VPEN(NN,N)=-STB(N)
      ENDIF
      IF(ICMB(N).EQ.3) THEN
      DO 110 JJ=1,5
  110 RNGE(N,JJ)=SRANGE
      NPIECE(N)=NSYS(N)
      LL=NSYS(N)
      DO 860 L=1,LL
      RT(L,N)=0.
      VPEN(L,N)=0.
      HPEN(L,N)=ISWD
  860 UPEN(L,N)=SRANGE-STB(N)
      ENDIF
C
C    IF  SYSTEM N IS AN RPV,PATROL ETC,OR IS A COUNTERBATTERY ACOUSTIC
```

```
C   SYSTEM,THEN READ THE LOWER LEFT CORNER
C   (X,Y) COORDINATES AND THE X- AND Y- DIMENSIONS OF ALL NPIECE(N)
C   COVERAGE  RECTANGLES OF ALL MISSION PATHS FOR THE SYSTEM.
C   IF  SYSTEM N IS A STANO OR CTRBTRY RADAR FOR WHICH THE USER
C   SPECIFIES LOCATIONS(STB(N) .GE. 1000)THEN READ IN THE (X,Y)
C   COORDINATES FOR LOCATIONS OF ALL NSYS(N) EMPLACED RADARS.
C
        IF (ICMB(N).EQ.4.OR.ICMB(N).EQ.2
     +  .OR.(ICMB(N).LE.1.AND.STB(N).GT.1000)) THEN
        M=NPIECE(N)
        IF(ICMB(N).LE.1)M=NSYS(N)
        DO 400 I=1,M
  400   READ (5,6800) RT(I,N),VPEN(I,N),HPEN(I,N),UPEN(I,N)
      ENDIF
C   READ PROBABILITY OF AVAILABILITY AND SUVIVABILITY FOR SYSTEM N.
C
  500   READ (5,6900) FA(N),FS(N)
C
C   FOR EACH ELEMENT TYPE  READ MAXIMUM SENSOR RANGE(KM) OF SYSTEM N.
C   (NOT USED WITH PENETRATING SYSTEMS OR COUNTERBATTERY ACOUSTIC SYSTEMS)
C
        IF(ICMB(N).LE.1)READ (5,7000) (RNGE(N,JJ),JJ=1,5)
C
C   FOR EACH ELEMENT TYPE:
C      READ INHERENT SINGLE ELEMENT DETECTION PROBABILITY OF SYSTEM N
C      BY SENSOR ZONE.
C      ALSO READ THE MULTIPLIERS WHICH ADJUST THESE INHERENT DETECTION
C      PROBABILITIES FOR EACH ACTIVITY/ENVIRONMENT COMBINATION.READ A
C      RECORD FOR EACH ACTIVITY/ENVIRONMENT (A/E) COMBINATION IN THE SEQUENCE
C      (A/E):(1,1),(1,2),(2,1),(2,2).
C
        DO 600 IJ=1,IELT
          READ (5,6500) (PDET(IJ,IZ,N),IZ=1,10)
      DO 605  IZ=1,10
      IF(PDET(IJ,IZ,N).EQ.' .00'.OR.PDET(IJ,IZ,N).EQ.'0.00')
     +PDET(IJ,IZ,N)='    '
  605 CONTINUE
  600   CONTINUE
        DO 800 IA=1,2
          DO 800 IE=1,2
            DO 700 IJ=1,IELT
            READ (5,6500) (FC(IJ,IZ,N,IA,IE),IZ=1,10)
      DO 705  IZ=1,10
      IF(FC(IJ,IZ,N,IA,IE).EQ.' .00'.OR.FC(IJ,IZ,N,IA,IE).EQ.'0.00')
     +FC(IJ,IZ,N,IA,IE)='    '
  705 CONTINUE
  700 CONTINUE
  800   CONTINUE
  900 CONTINUE
      PRINT 7100, TD1,ID1
```

```
      PRINT 7200, (ZLAB(K),K=1,NZONE)
      PRINT 5800
      KUNIT=0
      DO 1600 IU=1,NUMU
C
C   READ THE PERSONNEL POSTURE DISTRIBUTION FOR UNIT TYPE IU IN
C   EACH TARGET ZONE.  POSTURE SUBSCRIPTS ARE:
C     1- STANDING
C     2- PRONE
C     3- FOXHOLE
C     4- IN VEHICLES
C   ONLY STANDING PERSONNEL ARE TREATED IN PROGRAM PROCESSING.
C
        READ (5,7300) IOMIT(IU),(TPOS(IT,1,IU),IT=1,4),UID(IU)
        DO 1000 K=2,NZONE
          READ (5,7400) (TPOS(IT,K,IU),IT=1,4)
 1000   CONTINUE
      DO 1605 K=1,NZONE
      IF(TPOS(1,K,IU).EQ.' .00'.OR. TPOS(1,K,IU).EQ.'0.00')
     +TPOS(1,K,IU)='    '
 1605 CONTINUE
C
C    LOOP FOR EACH ELEMENT TYPE
C
        DO 1300 J=1,IELT
C
C   READ IN TO&E QUANTITY FOR EACH ELEMENT TYPE IN EACH UNIT TYPE
C   BY TARGET ZONE ALONG WITH THE 'OR' LUCRATIVENESS FRACTION AND,FOR
C   ELT TYPES 2 AND 3 (VEHICLES/CARRIERS),THE 'AND' LUCRATIVENESS FRACTION.
C   FOR ELT TYPES 4 & 5 (ARTY/MISSILE/MORTAR),READ THE LUCRATIVENESS
C   THRESHOLD IN TERMS OF VOLLEYS FIRED. READ ROUNDS PER VOLLEY AND THE
C   FRACTION OF UNITS (OF THIS UNIT TYPE) WHICH ARE FIRING THIS ELT TYPE
C   DURING THE SCANNING PERIOD.
C
          IF (J.LT.4) READ (5,7500) (IQET(J,K,IU),K=1,10),TPCT(J),TPCT1(
     +    J)
          IF (J.GE.4) READ (5,7600) (IQET(J,K,IU),K=1,10),TPCT(J),ITRPB(
     +    J),IRPS(J),(PFIR(J,K),K=1,10)
       IF(TPCT(J).EQ.'.00')TPCT(J)='   '
       IF(TPCT1(J).EQ.'.00')TPCT1(J)='   '
      DO 1305 K=1,10
      IF(IQET(J,K,IU).EQ.'   0')IQET(J,K,IU)='    '
 1305 CONTINUE
          XXX(J,IU)=TPCT(J)
          XXY(J,IU)=TPCT1(J)
          DO 1200 IA=1,2
            DO 1200 IE=1,2
              IF (IA*IE.NE.1) GO TO 1100
              READ (5,7700) (FACT(IA,IE,J,K,IU),K=1,10),(ISAL(J,K),K=1,1
     +        0)
```

```
              GO TO 1201
 1100         READ (5,7700) (FACT(IA,IE,J,K,IU),K=1,10)
 1201 DO 1205 K=1,10
        IF(FACT(IA,IE,J,K,IU).EQ.' .00'.OR. FACT(IA,IE,J,K,IU).EQ.'0.00')
     +FACT(IA,IE,J,K,IU)='    '
 1205 CONTINUE
 1200      CONTINUE
 1300    CONTINUE
         IF (IOMIT(IU).LT.0) GO TO 1600
       KUNIT=KUNIT+1
         DO 1400 IJ=1,5
           IF (ITRPB(IJ).EQ.0) GO TO 1400
           GO TO 1500
 1400    CONTINUE
         PRINT 7800, UID(IU)
         IF (MOD(KUNIT,5).EQ.0) PRINT 5800
         GO TO 1600
C
C   PRINT TABLE 3 ** ARTY/MISSILE FIRING FACTORS **
C
 1500    IF (IJ.EQ.4) PRINT 7900, UID(IU),IRPS(4),ITRPB(4),(PFIR(4,K),
     +   ISAL(4,K),K=1,NZONE)
         IF (IJ.EQ.5) PRINT 8000, UID(IU),IRPS(5),ITRPB(5),(PFIR(5,K),
     +   ISAL(5,K),K=1,NZONE)
         IF (MOD(KUNIT,5).EQ.0) PRINT 5800
 1600 CONTINUE
C
C   PRINT TABLE 4 ** LUCRATIVENESS THRESHOLDS AND TO&E FOR EACH UNIT **
C
       KUNIT=0
       DO 1900 IU=1,NUMU
         IF (IOMIT(IU).LT.0) GO TO 1900
         KUNIT=KUNIT+1
         IF (MOD(KUNIT-1,7).NE.0) GO TO 1700
         PRINT 8100, TD1,ID1
         PRINT 8200
         PRINT 8300, (ZLAB(K),K=1,NZONE)
         GO TO 1800
 1700    PRINT 8400, (ZLAB(K),K=1,NZONE)
 1800    PRINT 8500, IU,UID(IU)
         DO 1900 J=1,IELT
           IF (J.NE.2.AND.J.NE.3)  THEN
             PRINT 8600, J,XXX(J,IU),(IQET(J,K,IU),K=1,NZONE)
           ELSE
             PRINT 8700, J,XXY(J,IU),XXX(J,IU),(IQET(J,K,IU),K=1,NZONE)
           ENDIF
 1900 CONTINUE
C
       IF (NSEN.GT.30) GO TO 11700
       IF (NZONE.GT.10) GO TO 11700
```

```
C   COMBINE WEATHER,SMOKE,AND TERRAIN LINE-OF-SIGHT FACTORS
C
      DO 2100 I=1,NSEN
        DO 2000 NZ=1,NZONE
          PDEG(NZ,I)=PWEA(I)*PSMO(I)*PCPF(I)*PVIS(NZ,I)*PWIND(I)
      PA(I)=FA(I)*FS(I)
 2000   CONTINUE
 2100 CONTINUE
C
C   PRINT TABLE 5 ** SENSOR EMPLOYMENT CHARACTERISTICS **
C
      PRINT 8800, TD1,ID1
      PRINT 8900
      DO 2200 I=1,NSEN
        IF (MOD(I-1,5).EQ.0) PRINT 5800
        II=ICMB(I)+1
        XX=THEA(I)*57.296
        MM=NPIECE(I)
        IF (ICMB(I).EQ.3) MM=NSYS(I)
        IF (ICMB(I).LE.1) MM=0
 2200 PRINT 9000, I,SID(I),ICMB(I),ST(II),NSYS(I),STB(I),THEA(I),XX,MM
      IF (NSEN.GT.24) PRINT 9100
      PRINT 9200
      PRINT 9300, (J,J=1,IELT)
      DO 2300 I=1,NSEN
      IF(ICMB(I).EQ.4 .OR. ICMB(I).EQ.2)GO TO 2300
        IF (MOD(I-1,5).EQ.0) PRINT 5800
      PRINT 9400, I,SID(I),(RNGE(I,JJ),JJ=1,5)
 2300 CONTINUE
      PRINT 9500, TD1,ID1
      PRINT 9600
      DO 2500 I=1,NSEN
        IF (ICMB(I).LE.1.AND.STB(I).LE.1000) GO TO 2500
C
C   PRINT TABLE 6 ** COVERAGE PATTERNS FOR PENETRATING SYSTEMS/CBTRY ACOUSTIC **
C
      IF (ICMB(I).LE.1) NPIECE(I)=NSYS(I)
        DO 2400 M=1,NPIECE(I)
      IF(M.EQ.1) PRINT 9700, I,SID(I),M,RT(M,I)
     +     ,VPEN(M,I),HPEN(M,I),UPEN(M,I)
          IF (M.GT.1) PRINT 9800, M,RT(M,I),VPEN(M,I),HPEN(M,I),UPEN(M,I
     +     )
 2400   CONTINUE
 2500 CONTINUE
C
C   PRINT TABLE 7 ** SYSTEM INHERENT DETECTION PROBABILITIES **
C
      DO 2800 I=1,NSEN
        IF (MOD(I-1,8).NE.0) GO TO 2600
```

```
      PRINT 9900, TD1,ID1
 2600    PRINT 10000, I,SID(I),(ZLAB(K),K=1,NSZONE)
      DO 2700 J=1,IELT
 2700    PRINT 10100, J,(PDET(J,K,I),K=1,NSZONE)
      PRINT 10200
 2800 CONTINUE
C
C   PRINT TABLE 8 ** MOTION & CONCEALMENT SYSTEM DEGRADATION FACTORS **
C
      DO 2900 I=1,NSEN
        PRINT 10300, TD1,ID1
        PRINT 10200
        PRINT 10400, (ZLAB(K),K=1,NSZONE)
        PRINT 5800
        DO 2900 J=1,IELT
          PRINT 5800
          DO 2900 IA=1,2
            DO 2900 IE=1,2
              M=IA+IE
              IF (IA.EQ.1) M=M-1
 2900 PRINT 10500, I,SID(I),J,M,(FC(J,K,I,IA,IE),K=1,NZONE)
C
C   PRINT TABLE 9 ** SYSTEM DEGRADATION FACTORS **
C
      DO 3100 NS=1,NSEN
        IF (MOD(NS-1,7).NE.0) GO TO 3000
        PRINT 10600, TD1,ID1
        PRINT 10700
 3000   NN=ICMB(NS)+1
        NM=NN-1
        DO 3100 K=1,NZONE
          IF (K.EQ.1) PRINT 10800, NS,SID(NS),TZ(K),PWEA(NS),
     +    PWIND(NS),PSMO(NS),PCPF(NS),PVIS(K,NS),PDEG(K,NS)
          IF (K.NE.1) PRINT 10900, TZ(K),PWEA(NS),PWIND(NS),PSMO(NS),PCP
     +    F(NS),PVIS(K,NS),PDEG(K,NS)
 3100 CONTINUE
C
C   PRINT TABLE 10 ** SYSTEM AVAILABILITY/SURVIVABILITY FACTORS **
C
        PRINT 10650, TD1,ID1
        PRINT 10750
      DO 3150 NS=1,NSEN
        IF(MOD(I-1,5).EQ. 0)PRINT 5800
 3150     PRINT 10850, NS,SID(NS),FA(NS),FS(NS),PA(NS)
C
C   PRINT TABLE 11 ** FRACTION PERSONNEL IN STANDING POSTURE **
C
        PRINT 11000, TD1,ID1
        PRINT 11100
        NN=ICMB(NS)+1
```

```
      MM=NN-1
      NK=(NUMU-1)/15+1
      DO 3300 KK=1,NK
        LAST=MIN0(15*KK,NUMU)
        PRINT 11200, (UID(J),J=15*KK-14,LAST)
        DO 3300 K=1,NZONE
          IF (K.EQ.1 ) THEN
          PRINT 11300, TZ(K),(TPOS(1,K,J),J=15*KK-14,LAST)
    ELSE
          PRINT 11400, TZ(K),(TPOS(1,K,J),J=15*KK-14,LAST)
    ENDIF
 3300   CONTINUE
C
C   PRINT TABLE 12 ** UNIT ACTIVITY ENVIRONMENT FACTORS **
C
      PRINT 3600
      DO 3500 IU=1,NUMU
        IF (IOMIT(IU).LT.0) GO TO 3500
        PRINT 11500, TD1,ID1
        PRINT 11600
        PRINT 5800
        DO 3500 J=1,IELT
          PRINT 5800
          DO 3500 IA=1,2
            DO 3500 IE=1,2
              M=IA+IE
              IF (IA.EQ.1) M=M-1
              PRINT 10550, UID(IU),J,M,(FACT(IA,IE,J,K,IU),K=1,NZONE)
 3500 CONTINUE
 3600 FORMAT (1H1)
 3700 FORMAT (30I2)
 3800 FORMAT (8A10)
 3900 FORMAT (10A8)
 4000 FORMAT (A2,I3,F5.3,6I5)
 4100 FORMAT (7I3,3X,I3)
 4200 FORMAT (20F4.2)
 4300 FORMAT (1X,I3,2X,10(2X,F4.0))
 4400 FORMAT (16I5)
 4410 FORMAT(16F5.1)
 4500 FORMAT (10F6.4)
 4600 FORMAT (1H1,10X,'** DATA SET INFORMATION **',60X,'* TABLE 1 *')
 4700 FORMAT (//,'++ DATA SET ID = ',A2,I3,' ++',//)
 4800 FORMAT (' NR OF  NR OF  NR TGT    NR OF  NR SEN  INHERENT DET')
 4900 FORMAT (' UNITS   ELTS   ZONES  SYSTEMS   ZONES   PROB BASED ON')
 5000 FORMAT (1X,I5,I6,2I8,I9,4X,A16)
      IF(ICMB(I).EQ.3)MM=NSYS(I)
 5100 FORMAT (///,5X,'*** SCALING FACTORS APPLIED TO EACH SYSTEM',' INHE
     +RENT PDET *** ',//)
 5200 FORMAT (1X,12A10)
 5300 FORMAT (1X,12F10.2)
```

```
5350 FORMAT(//,' *** ADD-ON TO EACH UNIT ''OR'' LUCRATIVENESS',
    +' FRACTION =',F5.3)
5360 FORMAT(///,' *** A NORMAL APPROXIMATION TO BINOMIAL IS ',
    +'APPLIED IF NR TGT ELTS EXCEEDS',I5,' ***')
5400 FORMAT (1H1,10X,'*** TARGET ZONE STRUCTURE ***',10X,'++ DATA',' BA
    +SE = ',A2,I3,' ++',26X,'*TABLE 2*',//,' SECTOR')
5500 FORMAT (1X,' WIDTH',10A8,//)
5600 FORMAT (/,I7,10F8.0)
5700 FORMAT (///,10X,'*** SENSOR ZONE STRUCTURE ***',//)
5800 FORMAT (/)
5900 FORMAT (1X,10A8,//)
5950 FORMAT(1X,10F8.1)
6000 FORMAT (1X,'FRAC =',2X,10F8.2)
6100 FORMAT (///,10X,'** FRACTION (FRAC) OF TGT ZONE SAMPLED BASED ON',
    +' EVERY N-TH  STRIP IN ZONE')
6200 FORMAT (/,9X,10A8)
6300 FORMAT (4X,'N =',2X,10I8)
6310 FORMAT(///,10X,' SIZE OF GRID SQUARE IN EACH TARGET',
    +' ZONE ')
6330 FORMAT(/,9X,10F8.1)
6400 FORMAT (3X,3(F4.0,1X),I2,A3,F4.2)
6500 FORMAT (10(A4,1X))
6550 FORMAT (10(F4.0,1X))
6600 FORMAT (1X,I3,2F6.0,6X,I6,F6.2)
6800 FORMAT (8F10.4)
6900 FORMAT (1X,2(F4.0,2X))
7000 FORMAT (2X,5(1X,F4.0))
7100 FORMAT (1H1,26X,'*** ARTY/MISSILE FIRING FACTORS ***',10X,'++ DATA
    + BASE = ',A2,I3,' ++',4X,'* TABLE 3 *',//,8X,' RDS/ MIN',' SAL',7X
    +,'** FRAC UNITS FIRING / VOLLEYS FIRED BY BATTERY  ***',/,
    +'   UNIT VOLLY  TO DET ELT')
7200 FORMAT (//,25X,10(2X,A8))
7300 FORMAT (I2,4(1X,A4),A3)
7400 FORMAT (2X,4(1X,A4),A3)
7500 FORMAT (10A4,2A3)
7600 FORMAT (10A4,A3,2I3,10F3.1)
7700 FORMAT (10A4,10I4)
7800 FORMAT (4X,A3)
7900 FORMAT (4X,A3,I6,I8,' -4-',10(1X,F4.2,'/',I4))
8000 FORMAT (4X,A3,I6,I8,' -5-',10(1X,F4.2,'/',I4))
8100 FORMAT (1H1,////,4X,'** LUCR THRESHOLD & QUANTITY OF ELEMENTS (T',
    +'OE) IN UNIT FOR EACH TARGET ZONE **',6X,'++ DATA BASE = ',A2,I3,'
    +++',4X,'*TABLE 4 *',////,' UNIT ID')
8200 FORMAT (17X,'LUCRATIVENESS',/,21X,'FRACTIONS')
8300 FORMAT (16X,' (''AND'')  (''OR'')',1X,10A8)
8400 FORMAT (/,32X,2X,10A8)
8500 FORMAT (4X,A3)
8600 FORMAT (8X,'ELT =',I3,11X,A3,2X,10(4X,A4))
8700 FORMAT (8X,'ELT =',I3,4X,A3,4X,A3,2X,10(4X,A4))
8800 FORMAT (1H1,10X,'*** SENSOR EMPLOYMENT CHARACTERISTICS ***',10X,'+
```

```
     ++ DATA SET = ',A2,I3,' ++',14X,'* TABLE 5 *',///)
 8900 FORMAT (37X,'DEPLOYED   SENSOR SCAN ANGLE NR PIECES IN',/,21
     +X,'  SYSTEM TYPE    SYSTEMS STANDOFF  RADN/DEGR COVG PATTERN',/)
 9000 FORMAT (1X,'SYSTEM',2X,I3,'/',A3,2X,I2,1X,A15,I9,F9.2,F5.2,'/',
     +F5.0,I13)
 9100 FORMAT (1H1)
 9200 FORMAT (///,15X,'*** SENSOR RANGE FOR ELEMENT TYPE ***',/)
 9300 FORMAT (/,18X,5I5)
 9400 FORMAT (' SYSTEM',2X,I3,'/',A3,2X,5F5.0)
 9500 FORMAT (1H1,5X,'*** COVERAGE PATTERN INPUT FOR PENETRATING /CBTR',
     +'Y ACOUSTIC SYS',5X,'++ DATA BASE = ',A2,I3,' ++',10X,'* TABLE 6',
     +' *',//)
 9600 FORMAT (16X,'  RECT LL CORNER LL CORNER  WIDTH  DEPTH',/,16X,' PIE
     +CE   X-COORD   Y-COORD  X-DIM  Y-DIM',/)
 9700 FORMAT (1X,'SYSTEM',2X,I3,'/',A3,I6,2F10.2,2F7.2)
 9750 FORMAT (1X,'SYSTEM',2X,I3,'/',A3,16X,F10.2,2F7.2)
 9800 FORMAT (16X,I6,2F10.2,2F7.2)
 9900 FORMAT (1H1,10X,'*** SYSTEM INHERENT DETECTION PROBABILITIES ***',
     +10X,'++ DATA BASE = ',A2,I3,' ++',10X,'* TABLE 7 *',///)
10000 FORMAT (1X,'SYSTEM',2X,I3,'/',A3,' ELT',10A8)
10100 FORMAT (16X,I4,10(4X,A4))
10200 FORMAT (//)
10300 FORMAT (1H1,4X,'*** MOTION & CONCEALMENT DEGR FACTORS FOR INHEREN'
     +,'T SYSTEM DETECTION PROB ***',4X,'++DATA BASE=',A2,I3,3X,' ++',2X
     +,'* TABLE 8 *',///,25X,'STATE 1= MOVING/IN THE OPEN',/,25X,'STATE
     +2=MOVING/NOT IN OPEN',/,25X,'STATE 3=STATIONARY/IN THE OPEN',/,25X
     +,'STATE 4=STATIONARY/','NOT IN OPEN')
10400 FORMAT (1X,'SYSTEM ELT STATE',10A8)
10500 FORMAT (1X,I2,'/',A3,I4,I6,10(3X,A4))
10550 FORMAT (4X,A3,I4,I6,10(3X,A4))
10600 FORMAT (1H1,10X,'*** SYSTEM DEGRADATION FACTORS ***',10X,'++ DATA'
     +,' BASE = ',A2,I3,' ++',21X,'* TABLE 9 *',//,20X,'*** DEFINI','TIO
     +N OF TERMS ***'//,//,20X,'S=SYSTEM ID',/,20X,'K=TARGET ZONE',/,20X
     +,'PWEA(S)=PROB OF NO SENSOR DEGRADATION BY WEATHER',/,20X,'PSMO(S)
     +=PROB OF NO SENSOR DEGRADATION BY SMOKE',/,20X,'PCPF(S)=PROB OF NO
     + SENSOR DEGRADATION BY UNSATISFACTORY',' CREW PERF',/,20X,'PVIS(K,
     +S)=PROB OF UNOBSTRUCTED LINE OF SIGHT TO A TGT IN',' TGT ZONE K')
10650 FORMAT (1H1,10X,'*** SYSTEM AVAILABILITY/SURVIVAL FACTORS ***',
     +10X,'DATA BASE = ',A2,I3,' ++',21X,'* TABLE 10 *',//,15X,'*** DEFI
     +NITION OF TERMS ***'//,//,15X,'S=SYSTEM ID',/,15X,
     +'FA(S)=PROB SENSOR IS AVAILABLE(AVAILABILITY)',/,15X,
     +'FS(S)=PROB SENSOR SURVIVES(SURVIVABILITY)',/,15X,
     +'PA(S)= (COMBINED)PROB SENSOR IS AVAILABLE & SURVIVES')
10700 FORMAT (//,1X,'SYSTEM TZONE PWEA(S) X PWIND(S) X PSMO(S)',
     +' X PCPF(S) X PVIS(K,S) = PDEG(K,S)',/)
10750 FORMAT (//,11X,'SYSTEM    FA(S) X FS(S) = PA(S)      ',/)
10800 FORMAT (/,I3,'/',A3,3X,A3,F8.2,F11.2,2F10.2,F12.2,F12.3)
10850 FORMAT (/,11X,I2,'/',A3,2F8.2,F8.3)
10900 FORMAT ( 9X,A3,F8.2,F11.2,2F10.2,F12.2,F12.3)
11000 FORMAT (1H1,20X,'*** PERSONNEL POSTURE FACTORS ***',
```

```
     +22X,'++ DATA BASE = ',A2,I3,' ++',2X,'* TABLE 11 *')
11100 FORMAT (//,18X,'TGTZONE --- FRACTION (OF TOT PERS) STANDING',
     +' IN TARGET ZONE ---',/)
11200 FORMAT (///,26X,15(2X,A3))
11300 FORMAT (/,22X,A3,1X,15(1X,A4))
11400 FORMAT (22X,A3,1X,15(1X,A4))
11500 FORMAT (1H1,4X,'*** FRACTION TIME ELEMENT TYPE  IS IN EACH ACTIV',
     +'ITY/ENVIRONMENT STATE ***',4X,'++DATA BASE=',A2,I3,3X,' ++',2X,'*
     + TABLE 12 *',///,25X,'STATE 1= MOVING/IN THE OPEN',/,25X,'STATE 2=
     +MOVING/NOT IN OPEN',/,25X,'STATE 3=STATIONARY/IN THE OPEN',/,25X,'
     +STATE 4=STATIONARY/','NOT IN OPEN')
11600 FORMAT (//,3X,'UNIT ELT STATE ZONE 1 ZONE 2 ZONE 3 ZONE 4 ZONE 5')
11700 END
```

APPENDIX C

DOMINANT SYSTEM POSTPROCESSOR SOURCE CODE

(NOT USED)

DOMINANT SYSTEM POSTPROCESSOR

```
C       *** THE DOMINANT SYSTEM POSTPROCESSOR ***
C
C       THIS ROUTINE READS INPUT CREATED ON LOGICAL UNIT 12 BY THE TADER
C       PROGRAM. IT THEN LISTS ,FOR EVERY UNIT PROCESSED,THE 5 MOST DOMINANT
C       (LARGEST) SINGLE SYSTEM POTAS CONTRIBUTING TO FORM THE UNIT POTA,ALONG
C       WITH THE ASSOCIATED SYSTEMS,THE CUMULATIVE EFFECT OF THE LISTED POTAS,
C       AND THE 'SINGLE SYSTEM POTA VS ELT TYPE' COMPONENTS OF THE LISTED
C       SINGLE SYSTEM POTAS.
C
C    FILES USED : INPUT - UNIT 12( ORDERED SINGLE SYSTEM POTAS- OUTPUT
C                                  FROM LOGICAL UNIT 12 OF TADER.)
C                 INPUT - UNIT 5
C
C                OUTPUT - PRINT
C                          ** VARIABLE DICTIONARY **
C
C    *** SIGNIFICANT LOCAL VARIABLES ***
C
C    NAME                 DIMENSION                  DESCRIPTION
C
C    ALL(K)               10             THE LABEL '% ALL'
C
C    ICMB(I)              30             THE TYPE OF SENSOR SYSTEM CHARACTERIZING
C                                        SYSTEM I:
C                                        ICMB=0 FOR STANO RADAR& STATIONARY GND OBSV
C                                        ICMB=1 FOR COUNTERBTRY/COUNTERMORTAR RADAR
C                                        ICMB=2 FOR COUNTERBTRY ACOUSTIC
C                                        ICMB=3 FOR STANDOFF AIR RADAR(SLAR)
C                                        ICMB=4 FOR RPV,PATROL,PENETRATING ABN RADAR
C                                        ICMB=5 FOR SPECIAL CASE PENETRATING SYS
C
C    ID1                  1              NUMERIC PART OF THE RUN ID (FROM TADER).
C
C    IDS(IU,K,NI)         (50,10,5)     THE SYSTEM NR OF THE NI-TH  MOST DOMINANT
C                                       SINGLE SYSTEM POTA SCANNING UNIT IU IN TGT
C                                       ZONE K.
C
C    KNT(JJ)              5             THE NUMBER OF SYSTEMS WITH SYSTEM TYPE =JJ.
C                                        (ICMB=4 AND 5 ARE COMBINED INTO JJ=4).
C
C    NSEN                                NUMBER OF (SENSOR) SYSTEMS
C
C    NUMU                 1              NUMBER OF UNIT TYPES PROCESED
C
C    NZONE                1              NUMBER OF TARGET ZONES.
C                                        THESE ARE BASED ON DISTANCE FROM FEBA.
C
C    PC(IU,K,NI)          (50,10,6)      ARRAY CONTAINING THE VALUE OF CUMULATIVE
C                                        EFFECT OF THE NI LARGEST SINGLE SYSTEM
```

```
C                                        POTAS (VS UNIT IU IN TGT ZONE K).
C
C  PI(IU,K,NI)        (50,10,6)          ARRAY CONTAINING THE VALUE OF THE NI-TH
C                                        LARGEST SINGLE SYSTEM POTA (VS. UNIT IU
C                                        TARGET ZONE K.
C
C  PUT(IU,K,JK,NI)    (50,10,5,6)        THE SINGLE SYSTEM POTA VALUE FOR THE
C                                        NI-TH DOMINANT SYSTEM .VS. ALL ELEMENTS
C                                        OF TYPE JK IN UNIT IU AND TGT ZONE K,
C                                        BASED ON THE 'OR' LUCRATIVENESS COND.
C
C  PUT1(IU,K,JK,NI)   (50,10,5,6)        THE SINGLE SYSTEM POTA VALUE FOR THE
C                                        NI-TH DOMINANT SYSTEM .VS. ALL ELEMENTS
C                                        OF TYPE JK IN UNIT IU AND TGT ZONE K,
C                                        BASED ON 'AND' LUCRATIVENESS COND.
C
C  SNAM(JJ,II)        (5,20)             ALPHA NAME OF II-TH SYS IN LIST OF
C                                        SYSTEMS OF TYPE JJ (INPUT).
C
C  SNAME(I)           30                 ALPHABETIC NAME OF SYSTEM I (INPUT).
C
C  TD1                1                  THE CHARACTER PART OF THE  RUN ID
C
C  UID(IU)            50                 ALPHABETIC ID FOR UNIT IU (FROM TADER).
C
C  UNIT(IU)           50                 LABEL FOR UNIT IU (INPUT).
C
      DIMENSION
     +    ALL(5),             ICMB(30),            IDS(50,10,30),
     +    ISYS(5,30),         KNT(5),              PC(50,10,30),
     +    PI(50,10,30),      UID(50),         UNIT(50),
     + PUT(50,10,5,6),PUT1(50,10,3,6)
      CHARACTER*3
     +    UID,ALL
      CHARACTER*4
     +    TGT
      CHARACTER*10
     +    UNIT
      CHARACTER*11
     +    SENS
      CHARACTER*13
     +    SNAM(5,20),         SNAME(30)
      READ (12,2100) TD1,ID1,NSEN
      READ (5,1700) SENS,TGT
      READ (5,1800) NUMU,NZONE,NLIST
      READ (5,1900) (UNIT(IU),IU=1,NUMU)
      READ (5,2000) (L,ICMB(L),SNAME(L),I=1,NSEN)
      DO 100 J=1,5
        KNT(J)=0
        DO 100 I=1,15
```

```
100 SNAM(J,I)='
    DO 400 J=1,5
      DO 300 I=1,NSEN
        IF (J.EQ.5) GO TO 200
        IF (ICMB(I).NE.(J-1)) GO TO 300
        KNT(J)=KNT(J)+1
        SNAM(J,KNT(J))=SNAME(I)
        ISYS(J,KNT(J))=I
        GO TO 300
200     IF (ICMB(I).LT.4) GO TO 300
        KNT(5)=KNT(5)+1
        SNAM(5,KNT(5))=SNAME(I)
        ISYS(5,KNT(5))=I
300   CONTINUE
400 CONTINUE
    IMAX=MAX0(KNT(1),KNT(2),KNT(3),KNT(4),KNT(5))
    DO 500 K=1,NZONE
500 ALL(K)='ALL'
    NPP=30/NLIST
    DO 600 IU=1,NUMU
      DO 600 K=1,NZONE
        DO 600 NI=1,NSEN
    IF(NI.LE.5)
   +      READ (12,2200) UID(IU),IDS(IU,K,NI),PI(IU,K,NI),PC(IU,K,NI),
   +      (PUT(IU,K,JK,NI),JK=1,5),(PUT1(IU,K,JK,NI),JK=2,3)
    IF(NI.GT.5)
   +      READ (12,2200) UID(IU),IDS(IU,K,NI),PI(IU,K,NI),PC(IU,K,NI)
600 CONTINUE
    IL=NZONE/6+1
    DO 1100 IDO=1,IL
      LIM1=(IDO-1)*5+1
      LIM2=MIN0(IDO*5,NZONE)
      DO 1000 IU=1,NUMU
        IF (MOD(IU-1,NPP).NE.0) GO TO 800
        PRINT 2300, TD1,ID1
        PRINT 2400, SENS,TGT
        PRINT 2500
        PRINT 2600
        PRINT 2700
        PRINT 2800
        PRINT 2900
        DO 700 I=1,IMAX
700     PRINT 3000, (ISYS(J,I),SNAM(J,I),J=1,5)
        IF (IDO.EQ.1) PRINT 3100
        IF (IDO.EQ.2) PRINT 3200
        PRINT 3300
        PRINT 3400
800     PRINT 3500, UNIT(IU),(IDS(IU,K,1),PI(IU,K,1),PC(IU,K,1),K=LIM1
   +    ,LIM2)
        DO 900 NI=2,NLIST
```

```
 900      PRINT 3600, (IDS(IU,K,NI),PI(IU,K,NI),PC(IU,K,NI),K=LIM1,LIM2)
          PRINT 3700, (ALL(K),PC(IU,K,NSEN),K=LIM1,LIM2)
1000    CONTINUE
1100 CONTINUE
      DO 1600 IU=1,NUMU
        DO 1500 IDO=1,IL
          LIM1=(IDO-1)*5+1
          PRINT 2300, TD1,ID1
          PRINT 2400, SENS,TGT
          PRINT 3800,UNIT(IU)
          IF (IDO.EQ.1) PRINT 3900
          IF (IDO.EQ.2) PRINT 4000
          PRINT 4100
          PRINT 4200
          PRINT 4300
          PRINT 4400, (IDS(IU,K,1),PI(IU,K,1),(PUT(IU,K,J,1),
     +   J= 1,5),(PUT1(IU,K,J,1),J=2,3),K=1,2)
          DO 1200 NI=2,5
1200      PRINT 4500, (IDS(IU,K,NI),PI(IU,K,NI),(PUT(IU,K,J,NI),J=1,5),(
     +    PUT1(IU,K,J,NI),J=2,3),K=LIM1,LIM1+1)
          IF (IDO.EQ.1) PRINT 4600
          IF (IDO.EQ.2) PRINT 4700
          PRINT 4100
          PRINT 4200
          PRINT 4800
          DO 1300 NI=1,5
1300      PRINT 4500, (IDS(IU,K,NI),PI(IU,K,NI),(PUT(IU,K,J,NI),J=1,5),(
     +    PUT1(IU,K,J,NI),J=2,3),K=LIM1+2,LIM1+3)
          IF (IDO.EQ.1) PRINT 4900
          IF (IDO.EQ.2) PRINT 5000
          PRINT 5100
          PRINT 5200
          PRINT 5300
          DO 1400 NI=1,5
1400      PRINT 4500, IDS(IU,5,NI),PI(IU,5,NI),(PUT(IU,5,J,NI),J=1,5),(P
     +    UT1(IU,LIM1+4,J,NI),J=2,3)
1500    CONTINUE
1600 CONTINUE
1700 FORMAT (A11,A4)
1800 FORMAT (2I5,I4)
1900 FORMAT (8A10)
2000 FORMAT (4(1X,2I2,A13))
2100 FORMAT (A2,2I3)
2200 FORMAT (5X,A3,I5,8X,9F8.3)
2300 FORMAT (1H1,3X,'-- RUN ID=',A2,I3,' --')
2400 FORMAT (////,40X,'** ',A11,' SENSOR SYSTEMS VS. ',A4,' TARGET U','
    +NITS **')
2500 FORMAT (//,25X,'TABLE OF DOMINANT SINGLE SYSTEM POTA ''S  VS.',' U
    +NIT FOR EACH UNIT/ZONE COMBINATION',//)
2600 FORMAT (//,34X,'-- KEY TO SYSTEM ID''S --',/)
```

```
2700 FORMAT (//,8X,'STANO RADAR',5X,'COUNTERBTRY RADAR',2X,'CBTRY ','
    +ACOUSTIC',6X,'STANDOFF SLAR',5X,'PENETRATING SYS',/)
2800 FORMAT (5X,'-----------------',2X,'-----------------',2X,'--------
    +---------',2X,'-----------------',2X,'-----------------')
2900 FORMAT (5X,'SYS',16X,'SYS',16X,'SYS',16X,'SYS',16X,'SYS')
3000 FORMAT (5X,5(I2,2X,A13,2X))
3100 FORMAT (//,16X,'TGT ZONE 1',7X,'TGT ZONE 2',7X,'TGT ZONE 3',7X,
    +'TGT ZONE 4',7X,'TGT ZONE 5',/)
3200 FORMAT (//,16X,'TGT ZONE 6',7X,'TGT ZONE 7',7X,'TGT ZONE 8',7X,
    +'TGT ZONE 9',7X,'TGT ZONE 7',/)
3300 FORMAT (13X,'SYS   SYS   CUM',2X,'SYS   SYS   CUM',2X,'SYS   SYS',
    +'   CUM',2X,'SYS   SYS   CUM',2X,'SYS   SYS   CUM')
3400 FORMAT (4X,'UNIT ID',2X,' ID  POTA  POTA',2X,' ID  POTA  POTA',2X,
    +' ID  POTA  POTA',2X,' ID  POTA  POTA',2X,' ID  POTA  POTA')
3500 FORMAT (/,1X,A10,5(3X,I2,F6.3,F6.3))
3600 FORMAT (11X,5(3X,I2,F6.3,F6.3))
3700 FORMAT (11X,5(2X,A3,6X,F6.3))
3800 FORMAT (////,15X,'** ',A10,' **  DOMINANT SINGLE SYSTEM POTA''S V
    +S. EACH ELT TYPE IN EACH UNIT/ZONE')
3900 FORMAT (//,29X,'TGT ZONE 1',39X,'TGT ZONE 2',/)
4000 FORMAT (//,29X,'TGT ZONE 6',39X,'TGT ZONE 7',/)
4100 FORMAT (/,25X,'(''OR'' LUCRATIVE COND)',5X,'(''AND'' COND)',13X,'(
    +''OR'' LUCRATIVE COND)',3X,'(''AND'' COND)',/)
4200 FORMAT (15X,'SYS  SYS  ELT  ELT  ELT  ELT  ELT     ELT  ELT','
    + SYS  SYS  ELT  ELT  ELT  ELT  ELT     ELT  ELT ')
4300 FORMAT (4X,'            ID POTA    1    2    3    4    5       ','
    +2    3     ID POTA    1    2    3    4    5       2    3')
4400 FORMAT (/,11X,2(5X,I2,6F5.2,3X,2F5.2))
4500 FORMAT (11X,2(5X,I2,6F5.2,3X,2F5.2))
4600 FORMAT (//,29X,'TGT ZONE 3',39X,'TGT ZONE 4',/)
4700 FORMAT (//,29X,'TGT ZONE 8',39X,'TGT ZONE 9',/)
4800 FORMAT (12X,'    ID POTA    1    2    3    4    5       ','2    3
    +     ID POTA    1    2    3    4    5       2    3')
4900 FORMAT (//,29X,'TGT ZONE 5',/)
5000 FORMAT (//,29X,'TGT ZONE 10',/)
5100 FORMAT (/,25X,'(''OR'' LUCRATIVE COND)',5X,'(''AND'' COND)',/)
5200 FORMAT (15X,'SYS  SYS  ELT  ELT  ELT  ELT  ELT')
5300 FORMAT (12X,'    ID POTA    1    2    3    4    5       ','2    3'
    +)
     END
```

APPENDIX D

SORT/COUNT POSTPROCESSOR SOURCE CODE

(NOT USED)

SORT/COUNT POSTPROCESSOR

```
C      *** THE SORT/COUNT POSTPROCESSOR ***
C
C      THIS ROUTINE READS INPUT CREATED ON LOGICAL UNIT 14 BY THE TADER
C      PROGRAM. IT THEN PROCESSES CASES ,WITH EACH CASE DEFINED BY A
C      SPECIFIED UPPER BOUND AND A SPECIFIED LOWER BOUND. FOR EACH CASE,THE
C      ROUTINE OUTPUTS ONE OR BOTH OF :
C
C        (1) A MATRIX SHOWING THE NR OF UNITS WITH SINGLE SYSTEM POTAS BETWEEN
C            CASE BOUNDS FOR EACH TARGET ZONE AND ELEMENT TYPE.
C
C        (2) A MATRIX FOR EACH TARGET ZONE/ELT TYPE SHOWING WHICH SYSTEM/UNIT
C            COMBINATIONS HAVE SINGLE SYSTEM POTA VALUES WITHIN CASE BOUNDS.
C
C   FILES USED : INPUT - UNIT 14(BASIC SINGLE SYSTEM POTA'S - OUTPUT
C                              FROM LOGICAL UNIT 14 OF TADER.)
C                INPUT - UNIT 5
C
C               OUTPUT - PRINT
C
C                        ** VARIABLE DICTIONARY **
C
C  *** SIGNIFICANT LOCAL VARIABLES ***
C
C  NAME                DIMENSION                 DESCRIPTION
C
C  BU(N)               50             LOWER BOUND FOR SINGLE SYS POTAS SORTED
C                                     IN CASE N.
C
C  CFE(K,J,NI,IU)      (10,5,30,50)   MATRIX ENTRY SHOWING IF SYSTEM NI VS ELT
C                                     TYPE J IN UNIT IU AND TGT ZONE K HAS A
C                                     SINGLE SYSTEM POTA WITHIN CASE BOUNDS.
C
C  CFU(K,NI,IU)        (10,30,50)     MATRIX ENTRY SHOWING IF SYSTEM NI VS UNIT
C                                     UNIT IU IN TGT ZONE K HAS A SINGLE SYSTEM
C                                     POTA WITHIN CASE BOUNDS.
C
C  ID1                 1              NUMBERIC PART OF RUN ID (FROM TADER).
C
C  IELT                1              NUMBER OF ELEMENT TYPES
C
C  IFLAG(N)            50             IF THIS IS .GT. 0,ONLY THE MATRIX SHOWING
C                                     NR OF UNITS WITH SINGLE SYS POTA IN CASE
C                                     BOUNDS,BY TGT ZONE AND ELT TYPE, IS PRINTED
C                                     IF .LE. 0, THE MATRIX ,FOR EACH TGT ZONE
C                                     SHOWING WHICH SYS/UNIT/ELT COMBINATIONS
C                                     AND ELT TYPE SHOWING WHICH SYS/UNIT
C                                     COMBINATIONS  HAVE SINGLE SYS POTAS
C                                     IN CASE BOUNDS IS ALSO PRINTED.
C
```

```
C  IUNIT(I,K)         (50,10)       THE I-TH(ORDER OF INPUT) UNIT ID OF THOSE
C                                   UNITS NORMALLY IN TGT ZONE K.
C
C  IZ(K)              10            THE TOTAL NUMBER OF UNITS NORMALLY FOUND
C                                   TGT ZONE K.
C
C  LL(IZ)             30            LABELS FOR TGT ZONES.
C
C  NCASE              1             NUMBER OF CASES  PROCESSED (INPUT).
C
C  NOTE(K,J,NI)       (10,5,30)     THE NUMBER OF UNITS W/ SINGLE SYS POTAS
C                                   BETWEEN CASE BOUNDS FOR SYS NI SCANNING
C                                   ELT TYPE J IN TGT ZONE K.
C
C  NOTU(K,NI)         (10,30)       THE NUMBER OF UNITS W/ SINGLE SYS POTAS
C                                   BETWEEN CASE BOUNDS FOR SYS NI SCANNING
C                                   UNITS IN TGT ZONE K.
C
C  NSEN               1             NUMBER OF SYSTEMS
C
C  NUMU               1             NUMBER OF UNITS
C
C  NZONE              1             NUMBER OF TARGET ZONES
C
C  PUL(K,NI,II)       (10,30,50)    THE SINGLE SYSTEM POTA FOR EACH SYSTEM NI
C                                   .VS.  UNIT II IN TARGET ZONE K.
C
C  PUT(K,J,NI,II)     (10,5,30,50)  THE SINGLE SYSTEM POTA VALUE FOR EACH
C                                   SYSTEM NI .VS. ALL ELEMENTS OF TYPE J IN
C                                   UNIT II TARGET ZONE K.
C
C  SID(I)             30            ALPHABETIC ID FOR SYSTEM I (FROM TADER).
C
C  TD1                1             CHARACTER PART OF THE RUN ID (FROM TADER).
C
C  UU(N)              50            UPPER BOUND FOR SINGLE SYS POTAS SORTED
C                                   IN CASE N.
C
      DIMENSION
     +    BU(50),             IFLAG(50),          IUNIT(50,10),
     +    IZ(10),             LL(30),             NOTE(10,5,30),
     +    NOTU(10,30),        PUL(10,30,50),      PUT(10,5,30,50),
     +    UU(50)
      CHARACTER*3
     +    CFE(10,5,30,50),    CFU(10,30,50),      SID(50),
     +    UID(50)
      DO 100 L=1,30
  100 LL(L)=MOD(L-1,5)+1
      READ (5,1900) NUMU,NSEN,NZONE,NCASE,IELT,(IZ(K),K=1,NZONE)
      DO 200 K=1,NZONE
```

```
200 READ (5,1900) (IUNIT(I,K),I=1,IZ(K))
    READ (14,2000) TD1,ID1
    PRINT 2100
    DO 300 K=1,NZONE
300 PRINT 2200, K,(IUNIT(I,K),I=1,IZ(K))
    DO 400 N=1,NCASE
400   READ (5,2300) M, IFLAG(M),BU(M),UU(M)
    DO 500 IU=1,NUMU
      DO 500 I=1,NSEN
        DO 550 J=1,IELT
          READ (14,2400,END=600)    NI,SID(NI),II,UID(II),(PUT(K,J,NI,
   +      II),K=1,NZONE)
550 CONTINUE
          READ (14,2400)    NI,SID(NI),II,UID(II),(PUL(K,NI,II),K=1,NZ
   +      ONE)
500 CONTINUE
600 DO 1800 N=1,NCASE
      DO 700 K=1,NZONE
        DO 700 NI=1,NSEN
          NOTU(K,NI)=0
          DO 700 J=1,IELT
700   NOTE(K,J,NI)=0
      DO 800 K=1,NZONE
        NUM=IZ(K)
        DO 800 IX=1,NUM
          IU=IUNIT(IX,K)
          DO 800 NI=1,NSEN
            CFU(K,NI,IU)='   '
            X=PUL(K,NI,IU)
            IF (X.GT.BU(N).AND.X.LE.UU(N))  THEN
              CFU(K,NI,IU)='  X'
              NOTU(K,NI)=NOTU(K,NI)+1
            ENDIF
            DO 800 J=1,IELT
              CFE(K,J,NI,IU)='   '
              X=PUT(K,J,NI,IU)
              IF (X.GT.BU(N).AND.X.LE.UU(N))  THEN
                CFE(K,J,NI,IU)='  X'
                NOTE(K,J,NI)=NOTE(K,J,NI)+1
              ENDIF
800   CONTINUE
      IF (IFLAG(N).GT.0) GO TO 1300
      IN=NUMU/41+1
      DO 1000 IDF=1,IN
        LU1=(IDF-1)*40+1
        LU2=MIN0(IDF*40,NUMU)
        DO 900 K=1,NZONE
          PRINT 2600, N,TD1,ID1
          PRINT 2700, K
          PRINT 2800, BU(N),UU(N)
```

```
            PRINT 2900, (J,J=LU1,LU2)
            DO 900 NI=1,NSEN
              IF (MOD(NI-1,5).EQ.0) PRINT 3000
 900        PRINT 3100, NI,NOTU(K,NI),(CFU(K,NI,IU),IU=LU1,LU2)
1000      CONTINUE
          DO 1200 IDF=1,IN
            LU1=(IDF-1)*40+1
            LU2=MIN0(IDF*40,NUMU)
            DO 1100 K=1,NZONE
              DO 1100 J=1,IELT
                PRINT 3200, K,J
                PRINT 2800, BU(N),UU(N)
                PRINT 2900, (M,M=LU1,LU2)
                DO 1100 NI=1,NSEN
                  IF (MOD(NI-1,5).EQ.0) PRINT 3000
1100        PRINT 3100, NI,NOTE(K,J,NI),(CFE(K,J,NI,IU),IU=LU1,LU2)
1200      CONTINUE
1300      IL=NZONE/6+1
          DO 1700 IDO=1,IL
            LIM1=(IDO-1)*5+1
            LIM2=MIN0(IDO*5,NZONE)
            PRINT 2600, N,TD1,ID1
            PRINT 3300, BU(N),UU(N)
            PRINT 3400
            PRINT 3500
            DO 1400 I=1,30
1400        LL(I)=LL(I)+5*(IDO-1)
            PRINT 3600, (LL(I),I=1,30)
            DO 1500, NI=1,NSEN
              IF (MOD(NI-1,5).EQ.0) PRINT 3000
1500        PRINT 3700, NI,(NOTU(K,NI),K=LIM1,LIM2),((NOTE(K,J,NI),K=LIM1,
     +      LIM2),J=1,IELT)
            PRINT 3800
            DO 1600 K=1,NZONE
1600        PRINT 2200, K,(UID(IUNIT(I,K)),I=1,IZ(K))
1700      CONTINUE
1800 CONTINUE
1900 FORMAT (16I5)
2000 FORMAT (A2,I3)
2100 FORMAT (1H1,' ZONE   UNITS NORMALLY IN ZONE',//)
2200 FORMAT (/,3X,I2,3X,20(' ',A3,'  '),/,8X,20(' ',A3,'  '))
2300 FORMAT (2I5,2F5.3)
2400 FORMAT (I10,A3,I5,A3,3X,10F8.6)
2500 FORMAT (I5,A3,I5,A3,3X,10F8.6)
2600 FORMAT (1H1,5X,'+++++++  CASE=',I3,'  +++++++',5X,'+++ RUN ID=',A2
    +,I3,'  +++')
2700 FORMAT (//,5X,'***  ZONE=',I3,'   ***')
2800 FORMAT (/,3X,'*** SINGLE SYSTEM POTAS (VS UNIT) BETWEEN',F5.2,'
    +AND',F5.2,'  ***')
2900 FORMAT (//,' SYS  TOT',40I3)
```

```
3000 FORMAT (/)
3100 FORMAT (I4,1X,I4,40A3)
3200 FORMAT (//,5X,'***  ZONE=',I3,5X,' ELT=',I2,' ***')
3300 FORMAT (//,'*** SUMMARY-NUMBER OF SINGLE SYSTEM POTAS',' BETWEEN',
    +F5.3,' AND',F5.3,'  FOR UNITS NORMALLY IN ZONE  ***')
3400 FORMAT (/,13X,' UNIT',14X,'ELT 1',13X,'ELT 2',13X,'ELT 3',13X,'ELT
    + 4',13X,'ELT 5')
3500 FORMAT (/,13X,'-ZONE-',12X,'-ZONE-',12X,'-ZONE-',12X,'-ZONE-',12X,
    +'-ZONE-',12X,'-ZONE-')
3600 FORMAT (//,' SYS ',6(3X,5I3))
3700 FORMAT (I5,6(3X,5I3))
3800 FORMAT (////,' ZONE   UNITS NORMALLY IN ZONE',//)
     END
```

GLOSSARY

CAA	US Army Concepts Analysis Agency
elt	(target) element
FEBA	forward edge of the battle area
FLOT	forward line of own troops
ID	identifier
km	kilometers
POTA	probability of operational target acquisition
prob	probability
REMBASS	remotely monitored battlefield surveillance system
RPV	remotely piloted vehicle
sensor system	A collection of deployed sensors of a single type. All sensors of a system have identical characteristics except for location.
SIGINT	signal intelligence
SLAR	side looking airborne radar
STANO	surveillance, target acquisition, and night observation
target element	The basic component of a target unit. The five types of target elements represented in TADER are personnel, wheeled vehicles, tracked vehicles, artillery/rockets and mortars.
target unit	A representation of a military unit as a collection of co-located sets of target elements.
TADER	Target Detection Routine
TAS	Target Acquisition Study
TAS II	Target Acquisition Study II
TAS III	Target Acquisition Study III
tgt	target
TOE	table of organization and equipment

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